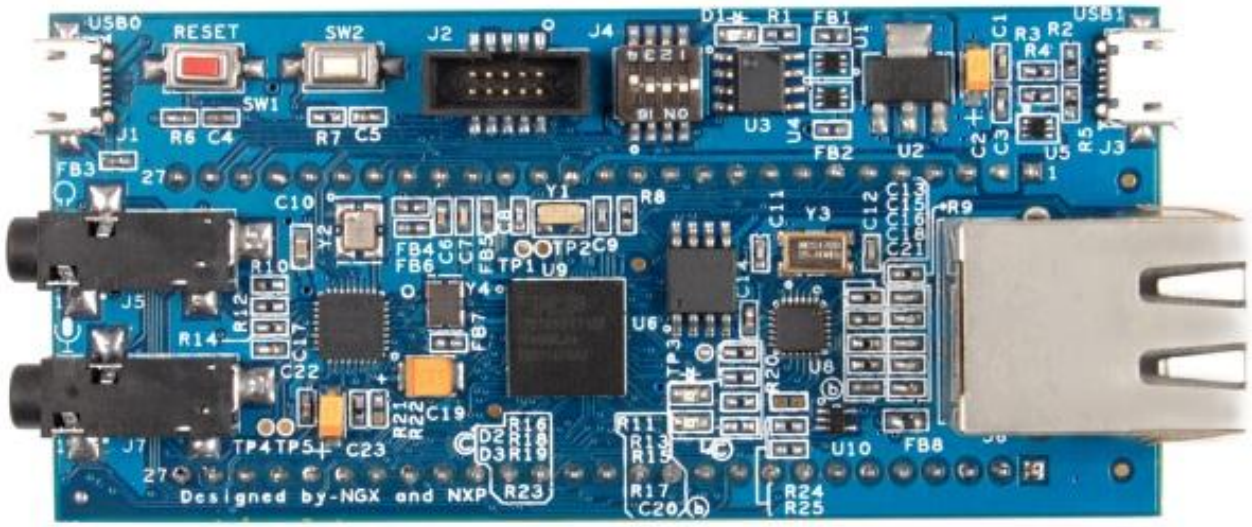
LPC1830-Xplorer



About NGX Technologies

NGX Technologies is a premier supplier of development tools for the ARM7, ARM Cortex M0, M3 and M4 series of microcontrollers. NGX provides innovative and cost effective design solutions for embedded systems. We specialize in ARM MCU portfolio, which includes ARM7, Cortex-M0, M3 & M4 microcontrollers. Our experience with developing evaluation platforms for NXP controller enables us to provide solutions with shortened development time thereby ensuring reduced time to market and lower development costs for our customers. Our cost effective and feature rich development tool offering, serves as a testimony for our expertise, cost effectiveness and quality.

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CE certification:

NGX Technologies LPC1830-Xplorer board has been tested for radiated emission as per EN55022 class a standard. The device is under the limits of the standard EN55022 class A and hence CE marked. No other test have been conducted other than the radiated emission (EN55022 class A standard). The device was tested with the ports like USB, Serial, and Power excluding the GPIO ports. Any external connection made to the GPIO ports may alter the EMC behavior. Usage of this device under domestic environment may cause unwanted interference with other electronic equipment's. User is expected to take adequate measures. The device is not intended to be used in and end product or any subsystem unless the user re-evaluates applicable directive/conformance.

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1.0 INTRODUCTION

This document is the User Manual for LPC1830-Xplorer; a cost effective evaluation platform for NXP's LPC18xx MCU. This document reflects its contents which include system setup, debugging, and software components. This document provides detailed information on the overall design and usage of the board from a systems perspective.

Before proceeding further please refer the Quick Start Guide for Xplorer features, Xplorer Unboxing and Xplorer verification. Kindly refer to the product page for the latest information.

Note: To restore the Factory Default for 'LPC1830 Xplorer Board' kindly refer to section 4.0

2.0 LPC1830-Xplorer Development Tool Setup

2.1 ULINK2/ME and KEIL

NGX's MCU evaluation platforms are not coupled tightly with any one particular combination of IDE and debugger. The following sections will explain the setup for KEIL and ULINK2/ME as the IDE and debugger respectively.

2.2 Installation & Configuration of KEIL software

The Installation of KEIL(MDK-ARM V4.23) software is explained below:

Step 1: Open the KEIL setup

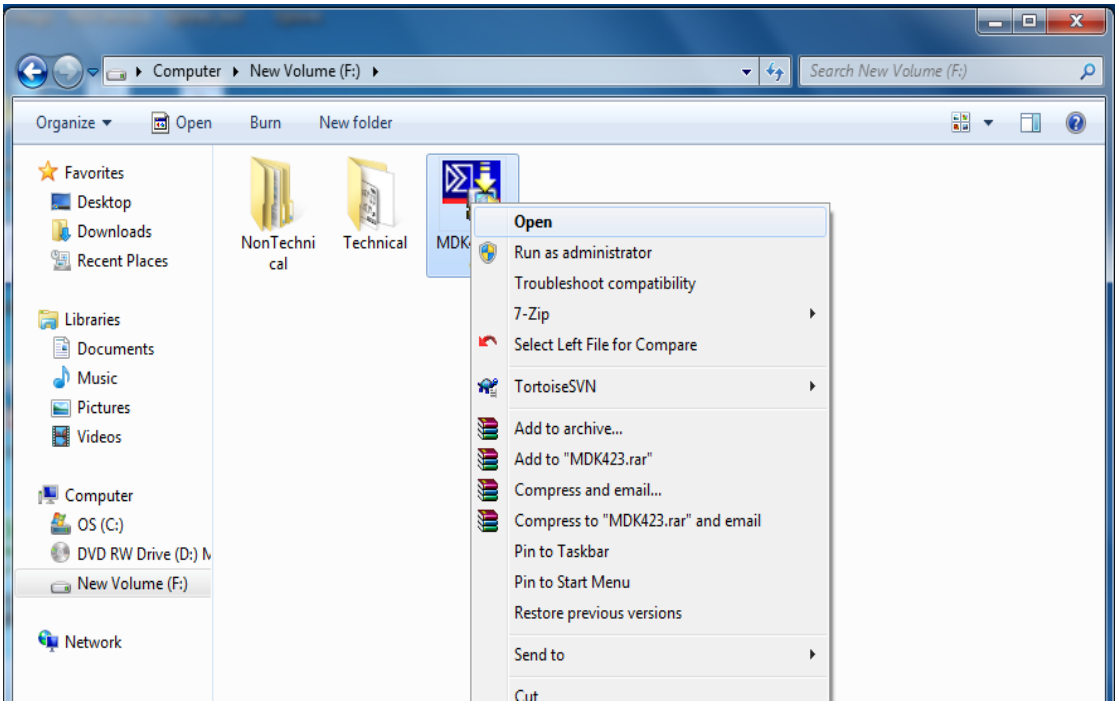

Fig.1

Step 2: Click on Next.

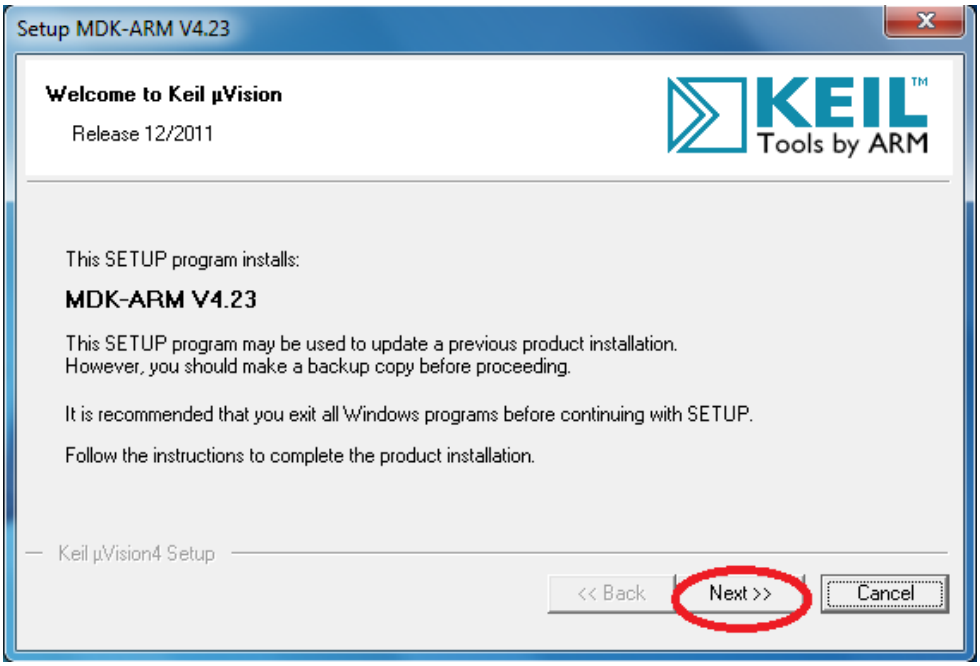
Setup MDK-ARM V4.23
Welcome to Keil µVision
Release 12/2011
KEIL™ Tools by ARM
This SETUP program installs:
MDK-ARM V4.23
This SETUP program may be used to update a previous product installation.
However, you should make a backup copy before proceeding.
It is recommended that you exit all Windows programs before continuing with SETUP.
Follow the instructions to complete the product installation.
Keil µVision4 Setup
<< Back
Next >>
Cancel

Fig.2

Step 3: To accept the agreement, click the check box and click Next.

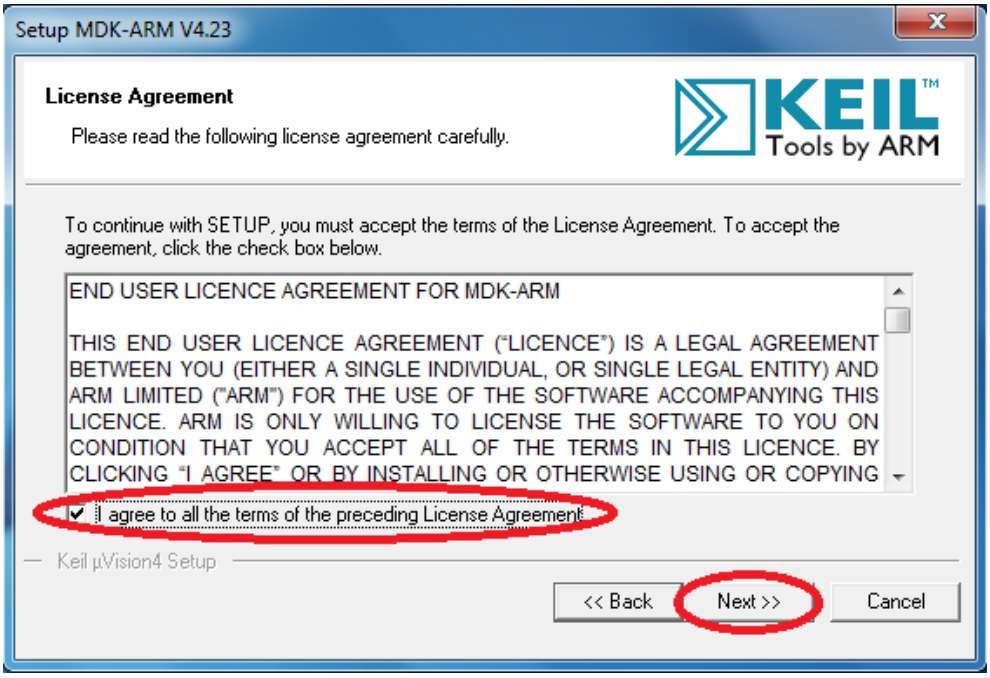
Setup MDK-ARM V4.23
License Agreement
Please read the following license agreement carefully.
KEIL™ Tools by ARM
To continue with SETUP, you must accept the terms of the License Agreement. To accept the agreement, click the check box below.
END USER LICENCE AGREEMENT FOR MDK-ARM
THIS END USER LICENCE AGREEMENT ("LICENCE") IS A LEGAL AGREEMENT BETWEEN YOU (EITHER A SINGLE INDIVIDUAL, OR SINGLE LEGAL ENTITY) AND ARM LIMITED ("ARM") FOR THE USE OF THE SOFTWARE ACCOMPANYING THIS LICENCE. ARM IS ONLY WILLING TO LICENSE THE SOFTWARE TO YOU ON CONDITION THAT YOU ACCEPT ALL OF THE TERMS IN THIS LICENCE. BY CLICKING "I AGREE" OR BY INSTALLING OR OTHERWISE USING OR COPYING
I agree to all the terms of the preceding License Agreement
Keil µVision4 Setup
<< Back
Next >>
Cancel

Fig.3

Step 4: Provide the destination path and click on Next

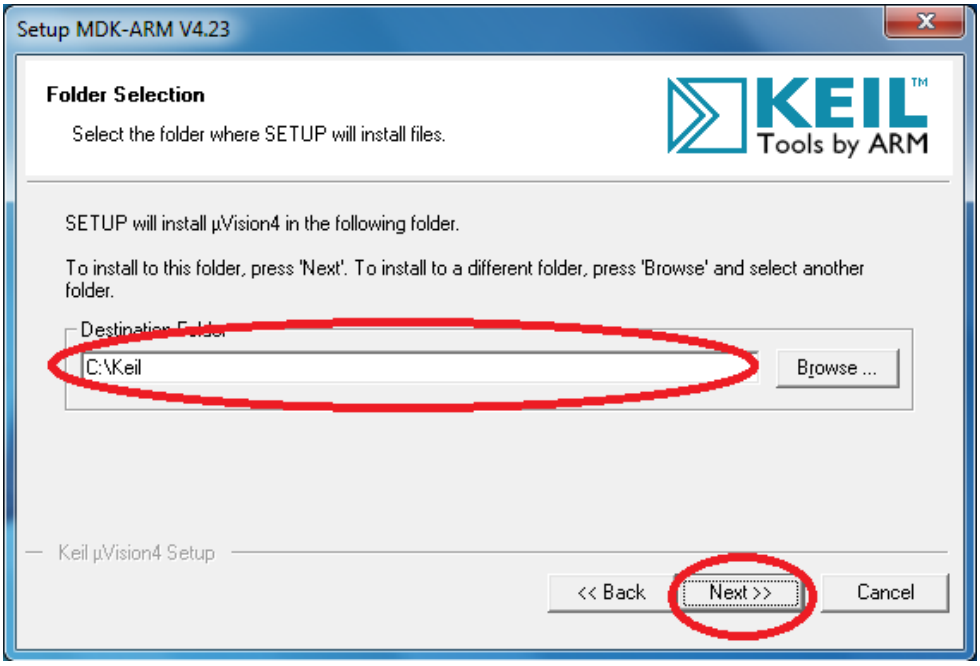
Setup MDK-ARM V4.23
Folder Selection
Select the folder where SETUP will install files.
KEIL Tools by ARM
SETUP will install µVision4 in the following folder.
To install to this folder, press 'Next'. To install to a different folder, press 'Browse' and select another folder.
Destination Folder
C:\Keil
Browse ...
Keil µVision4 Setup
<< Back
Next >>
Cancel

Fig.4

Step 5: Fill your personal information and click on Next

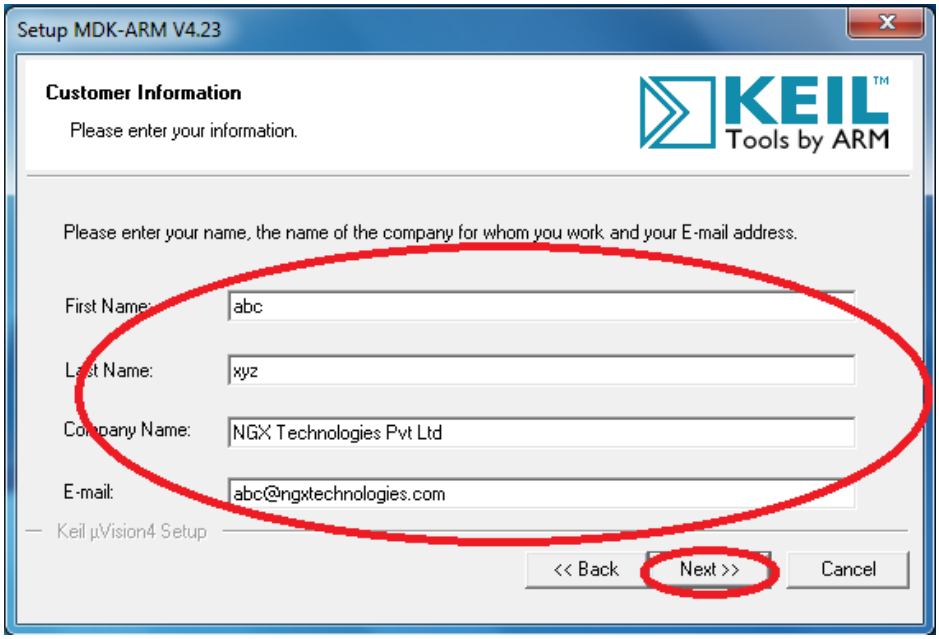

Fig.5

Step 6: Click on Next

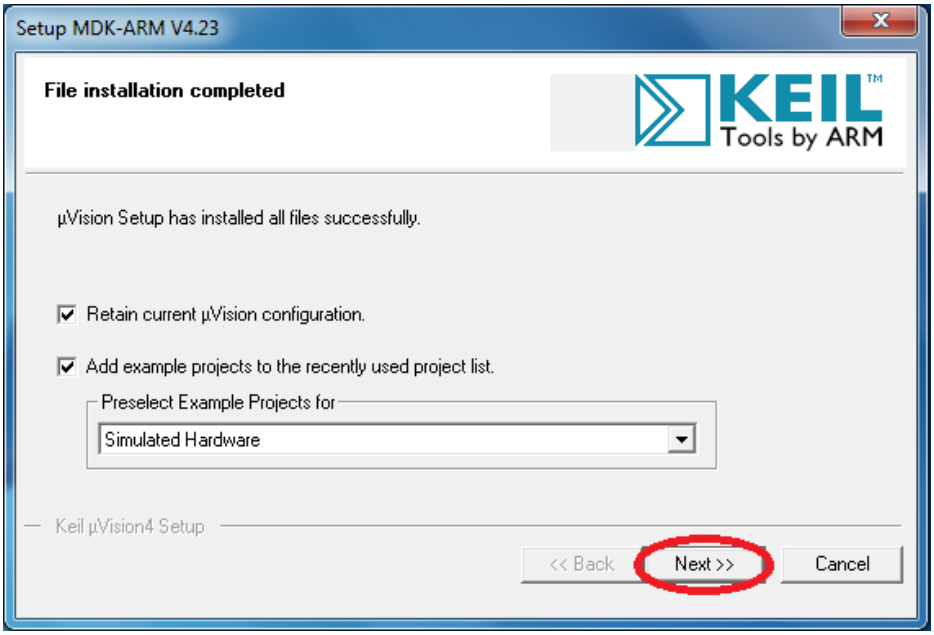

Fig.6

Step 7: Keil µVision4.23 setup is completed, click Finish.

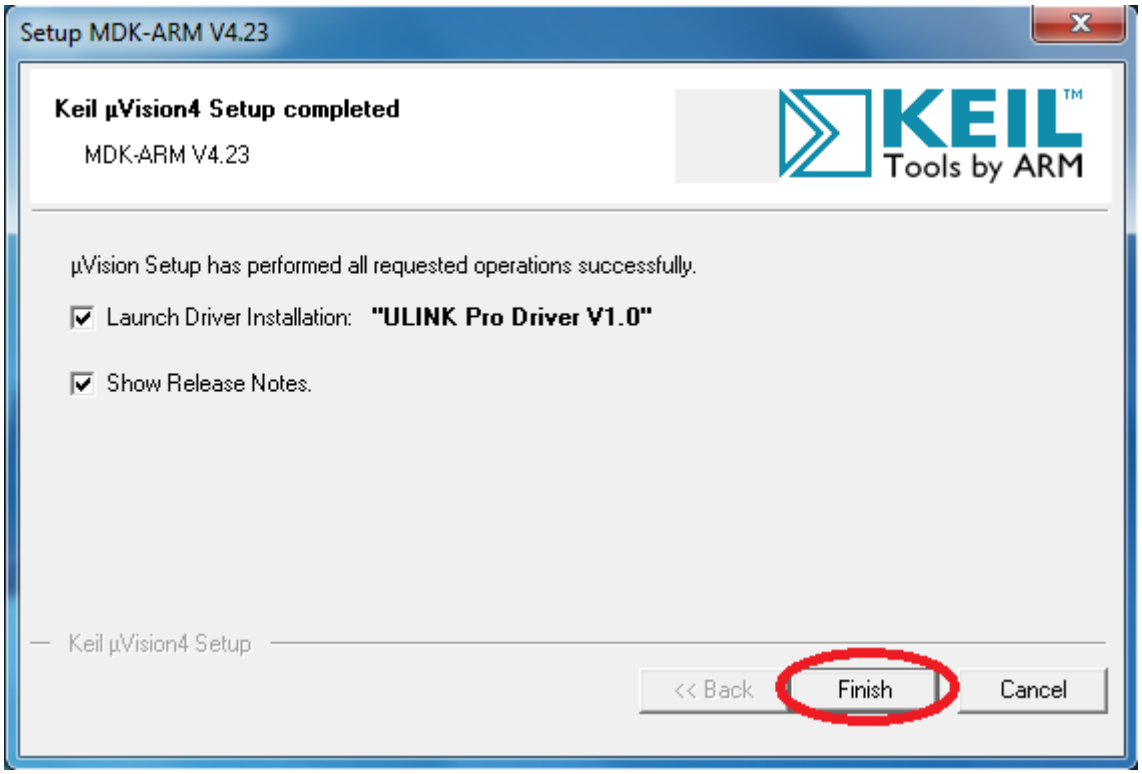

Fig.7

2.3 Configuration of ULINK2/ME Debugger

The configuration flow of ULINK2/ME Debugger is explained below:

Step 1: Open the KEIL blinky project downloaded from the website and click on the 'Target Options'.

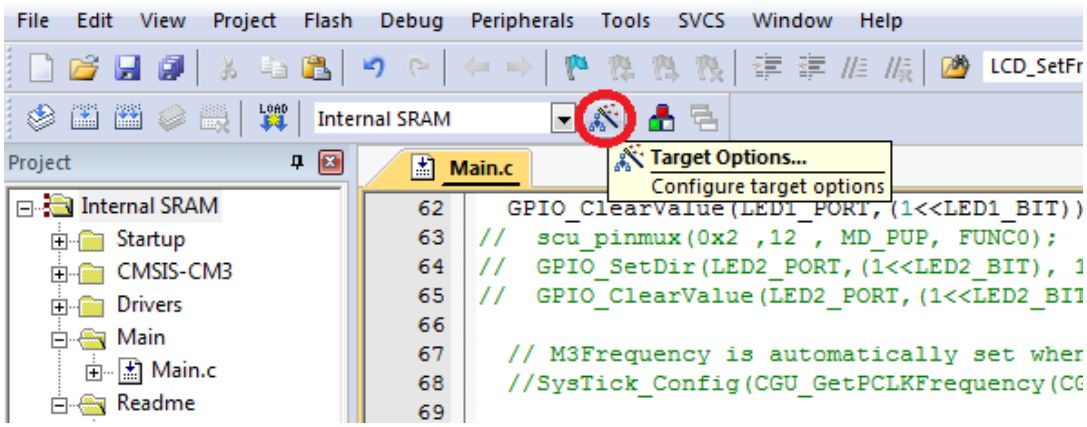

Fig.8

Step 2: The window opens as shown in the following image. Next click on Debug and then select the 'ULINK2/ME Cortex Debugger' as shown in the following image.

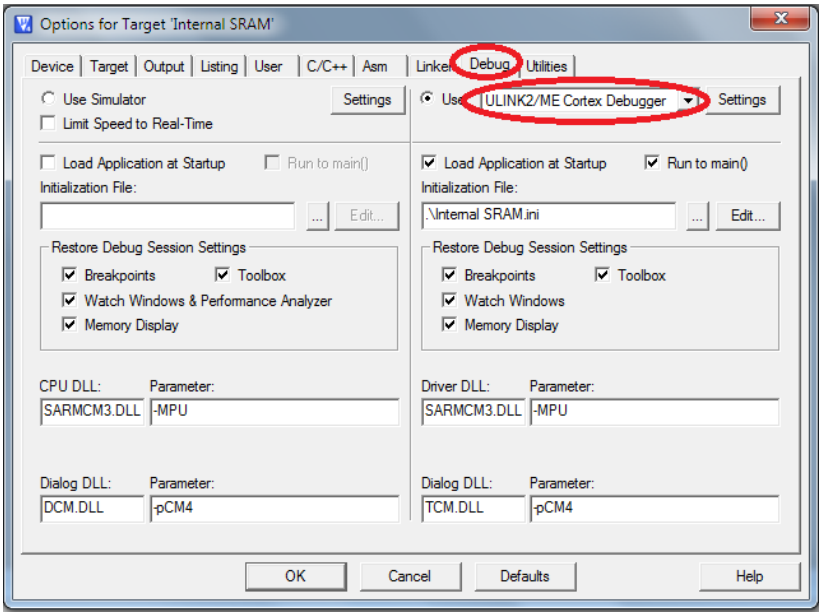

Fig.9

Step 3: Next click on the 'Settings Option', the 'Cortex-M Target Driver Setup' window opens then select SW port. After selection of the SW port the ULINK2/ME detected is as shown in the following image.

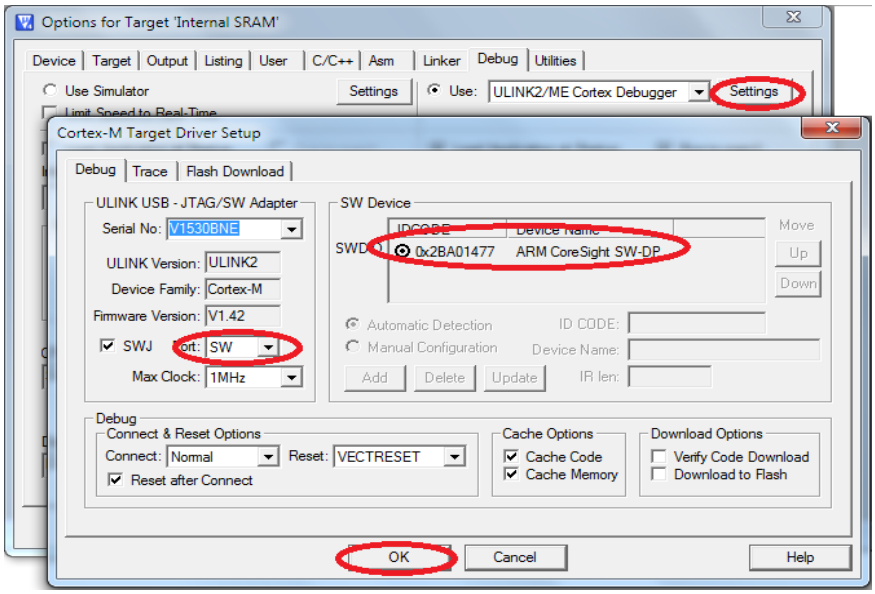

Fig.10

(Note: The Cortex M4 can be programed using SW or JTAG, while the Cortex M0 is visible through JTAG port.)

2.4 Configuring External Quad Flash

Step 1: Open the KEIL blinky project, then click on the 'Target Options'.

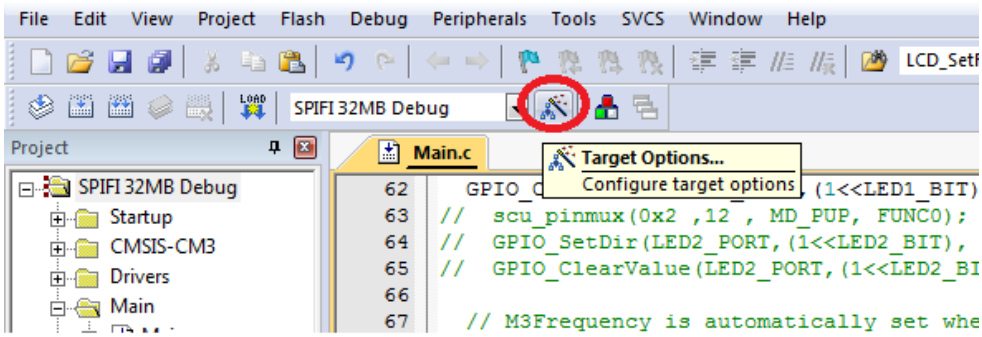

Fig.11

Step 2: The window opens as shown in the following image, click on Utilities and select ‘ULINK2/ME Cortex Debugger’.

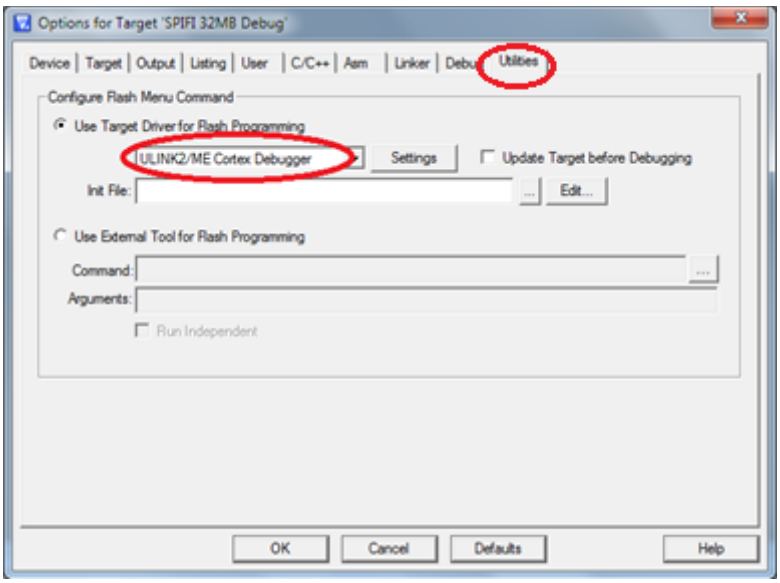

Fig.12

Step 2: Select ‘Update Target before Debugging’ check box, click on ‘Settings Options’ and in ‘Cortex-M Target Driver setup’ click add and select ‘LPC18xx/43xx S25FL032 SPIFI programing algorithm’ and click add.

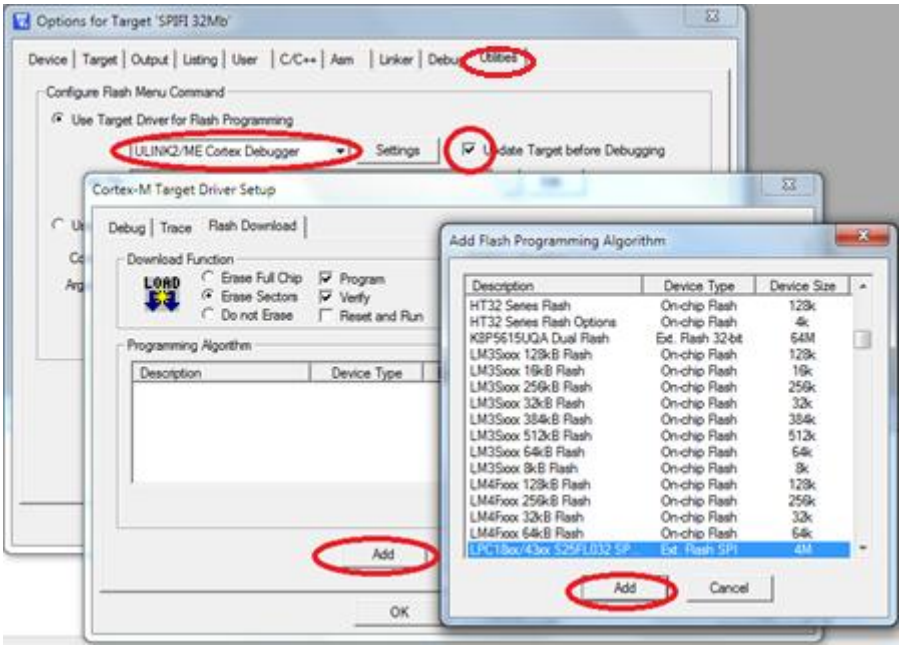

Fig.13

Click OK to complete the ‘ULINK2/ME Debugger configuration’.

2.5 Setup for ULINK2/ME and LPC1830 Xplorer Board

Option A: With ULINK-ME debugger

To run the KEIL examples you will need the following and the image shows the each components:

- ULINK-ME
- 10-pin ribbon cable
- LPC1830 Xplorer Board
- 2 USB AM to Micro B cable

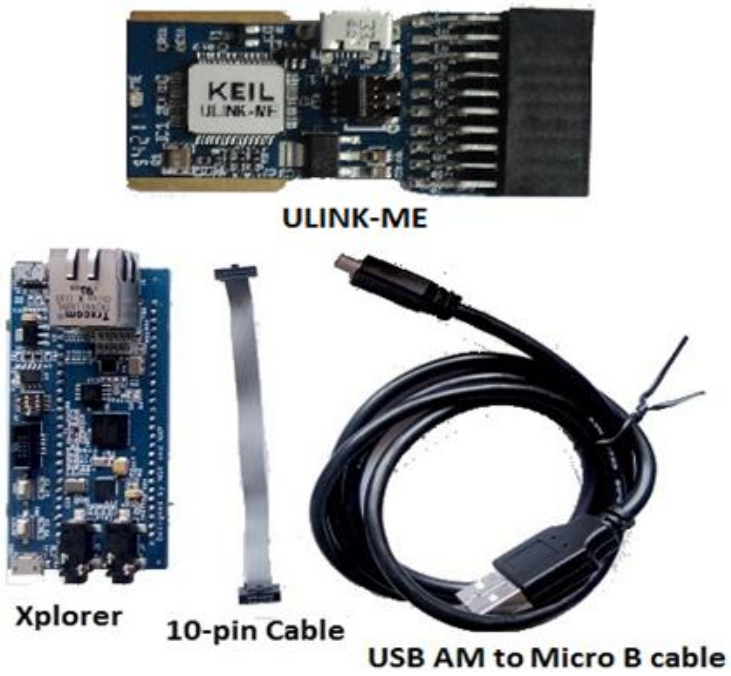

Fig.14

Steps to setup the ULINK-ME and LPC1830 Xplorer Board:
(Note: Please refer keil knowledgebase article for connecting ULINK2/ME 10-pin ribbon cable to NGX Xplorer)

Step 1: Connect one end of 10-pin ribbon cable to 'ULINK-ME 10-pin box header' as show in the following image.

Fig.15

Step 2: Connect other end of 10-pin ribbon cable to ‘10-pin box header’ of the LPC1830 Xplorer board as shown in the following image.

Fig.16

Step 4: Connect one end of ‘USB AM to Micro B’ cable to LPC1830 Xplorer board and other end to computer and connect one end of ‘USB AM to Micro B’ to ULINK-ME and other end to computer as shown in the following image.

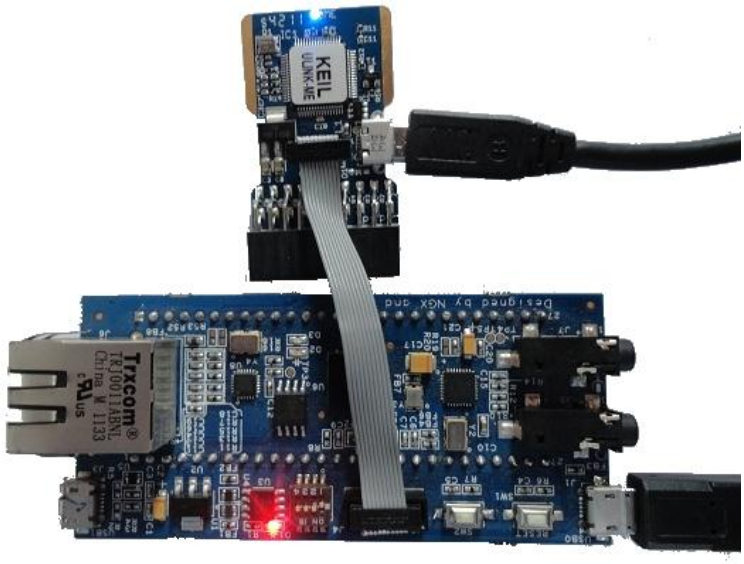

Fig.17

Step 5: The setup is now ready to be used for development with **KEIL IDE** and **ULINK-ME**.

Option B: With ULINK2 debugger

The Xplorer board has on board '10-pin SWD/JTAG box header'; ensure that the ULINK2/ME must have '10-pin SWD/JTAG' support for development. The ULINK2 debugger, '20-pin to 10-pin adapter' and 10-pin ribbon cable are not a part of the LPC1830 Xplorer package, the user needs to buy separately.

To run the KEIL examples you will need the following and the image shows the each components:

- ULINK2
- ARM JTAG to Cortex JTAG Adapter (20-pin to 10-pin Adaptor)
- 10-pin ribbon cable
- LPC1830 Xplorer Board
- One USB AM to Micro B cable

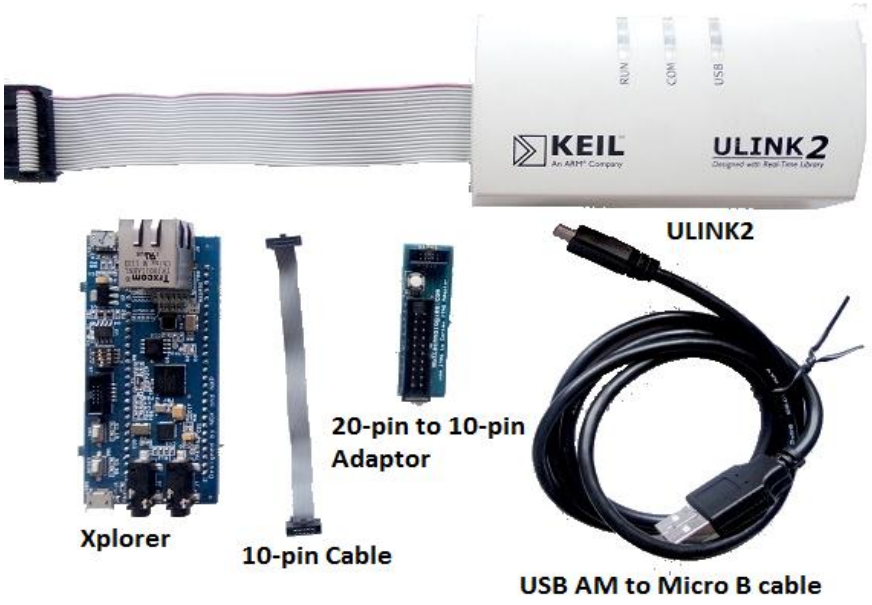

Fig.18

Steps to setup the ULINK2 and LPC1830 Xplorer Board:
(Note: Please refer keil knowledgebase article for connecting ULINK2/ME 10-pin ribbon cable to NGX Xplorer)

Step 1: Connect the one of 10-pin ribbon cable to '20-pin to 10-pin adapter' as shown in the following image.

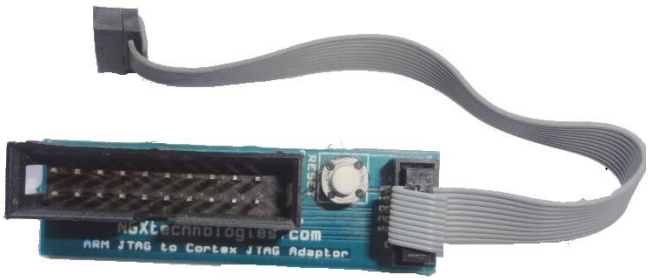

Fig.19

Step 2: Connect other end of 10-pin ribbon cable to ‘10-pin box header’ of the LPC1830 Xplorer board as shown in the following image.

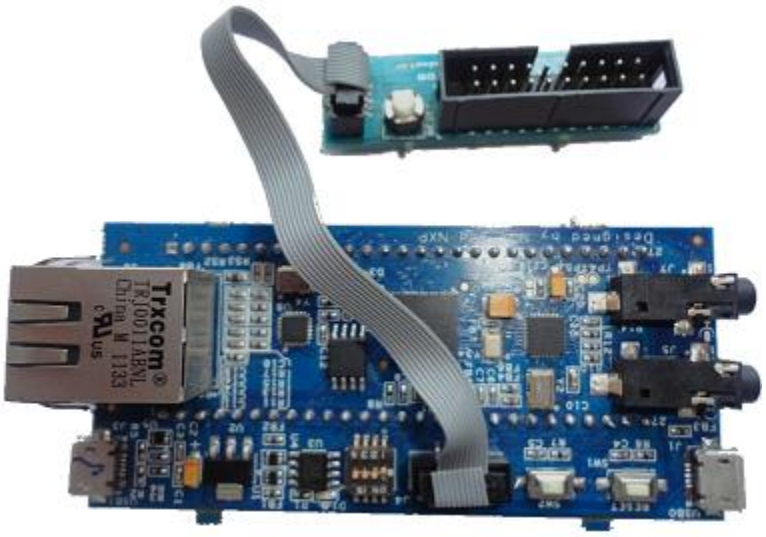

Fig.20

Step 3: Now connect the ‘ULINK2 20-pin’ cable to ‘20-pin to 10-pin adapter’ as shown in the following image.

Fig.21

Step 4: Connect one end of ‘USB AM to Micro B’ cable to LPC1830 Xplorer board and other end to computer, connect one end of ‘USB type B’ to ULINK2 and other end to computer as shown in the following image.

Fig.22

Step 5: The setup is now ready to be used for development with **KEIL IDE** and **ULINK2**.

3.0 LPC1830 Xplorer firmware Development

3.1 Creating the sample (Blinky) project in KEIL

Steps to create the sample (Blinky) project:

Step 1: Open a KEIL IDE.

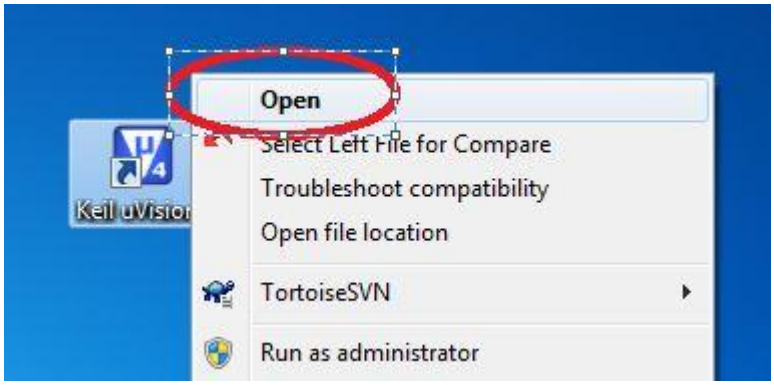

Fig.23

Step 2: Click on Project->New uVision Project… as show below.

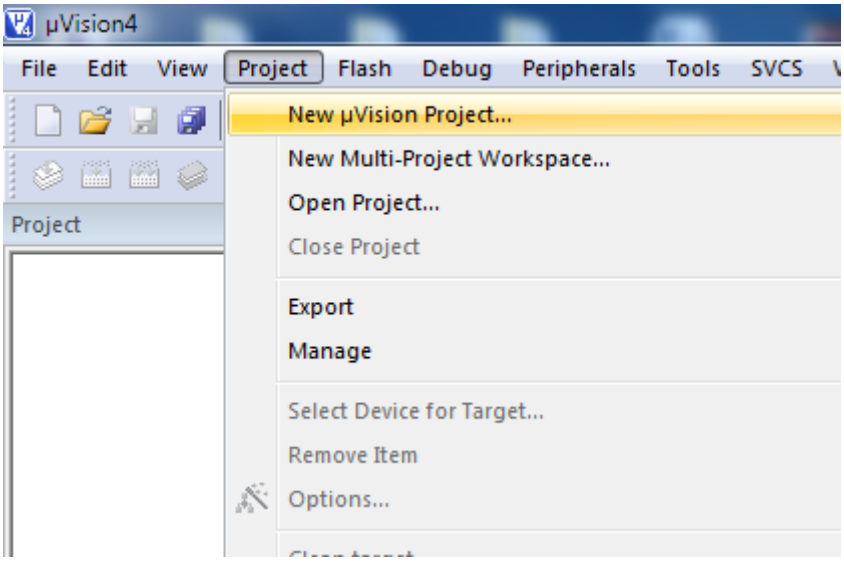

Fig.24

Step 3: Create a new folder in downloaded sample example folder and rename to Blinky and select Blinky folder click Open.

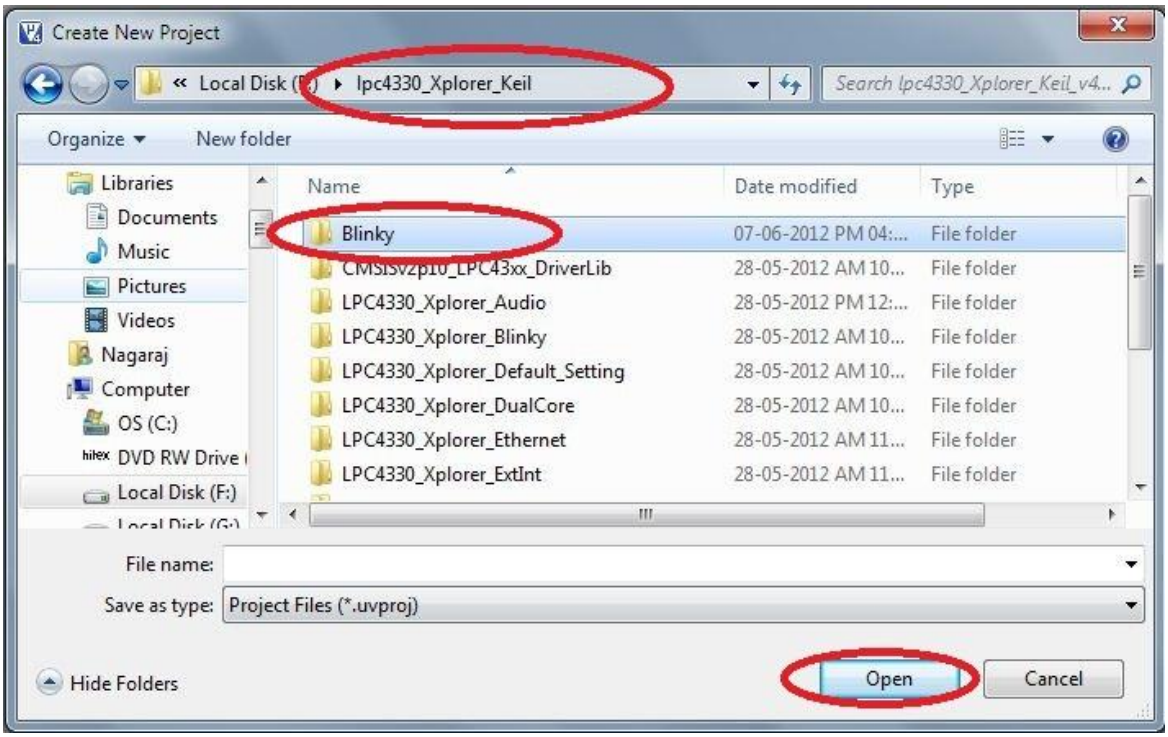

Fig.25

Step 4: Give a project name, example: 'LPC1830_Xplorer_Blinky' and click Save.

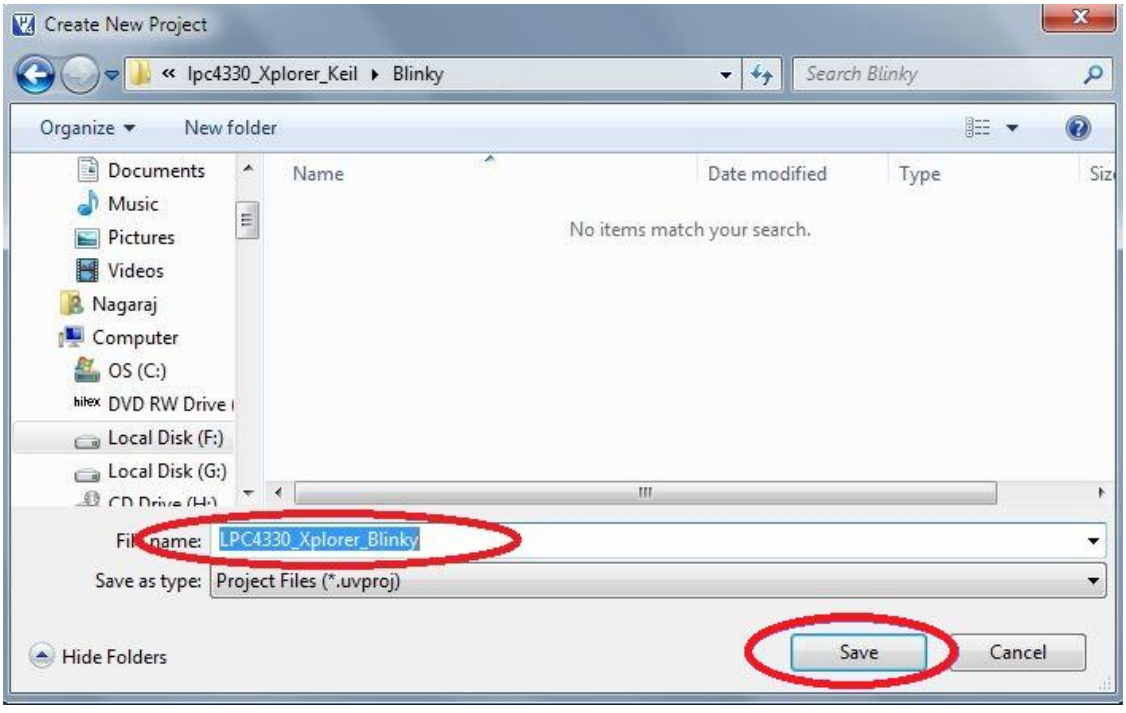

Fig.26

Step 5: Select the NXP(found by Philips) and search for the controller.

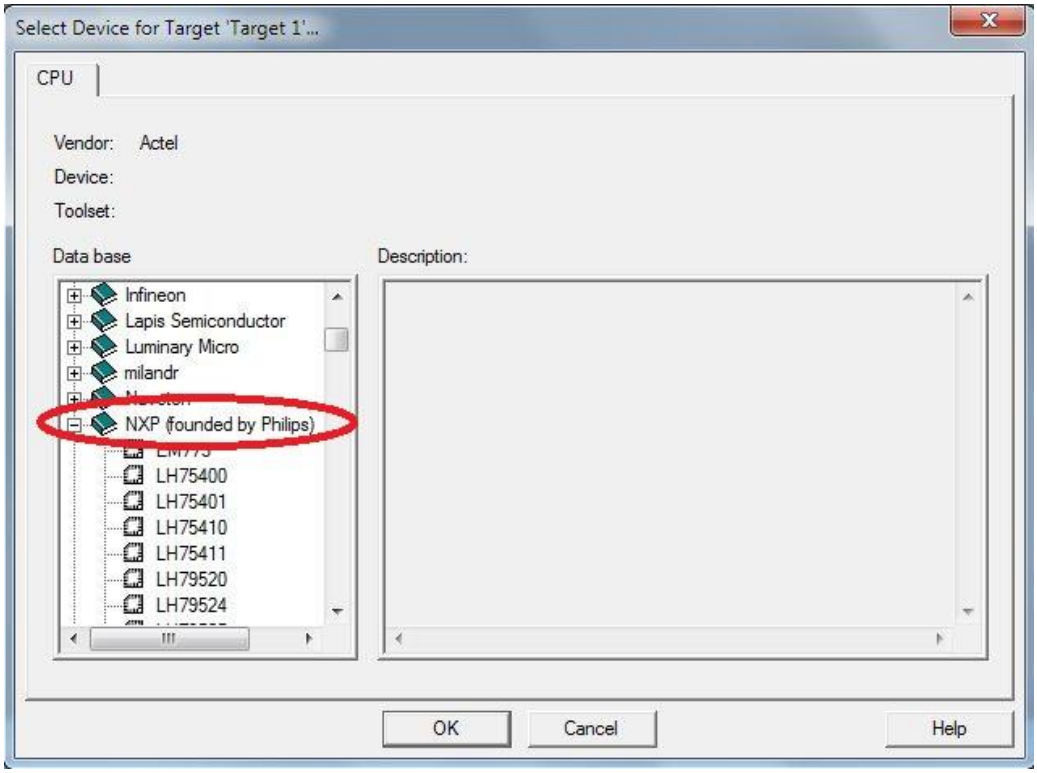

Fig.27

Step 6: Select LPC1830 controller and click OK.

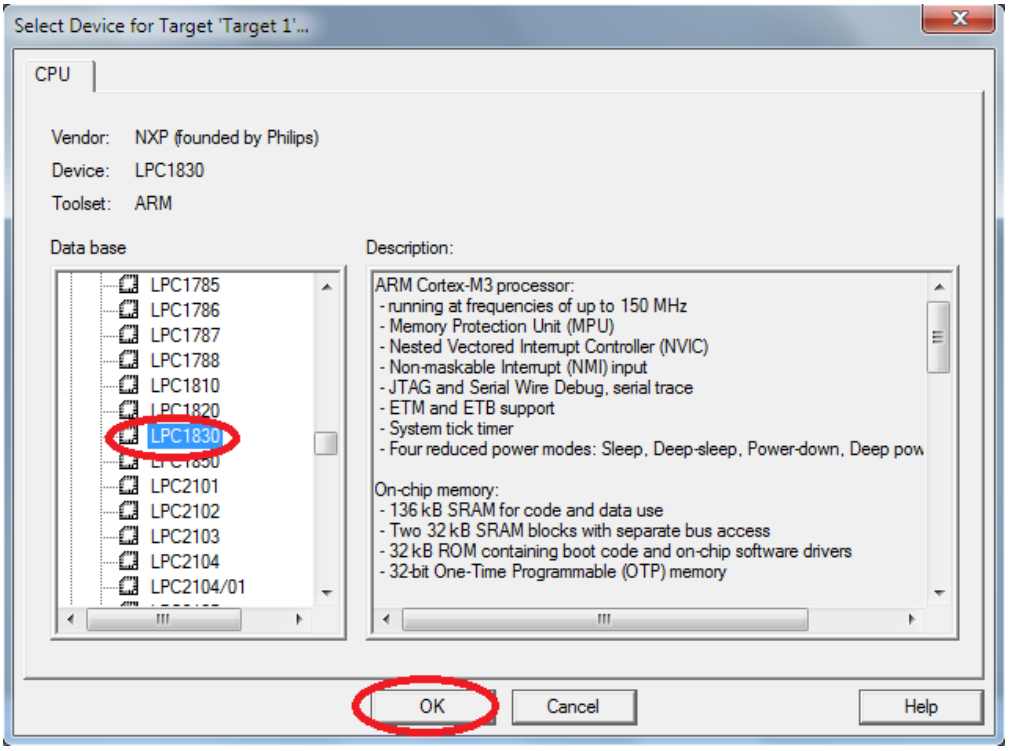

Fig.28

Step 7: Click YES to copy startup file to project polder and add file to project.

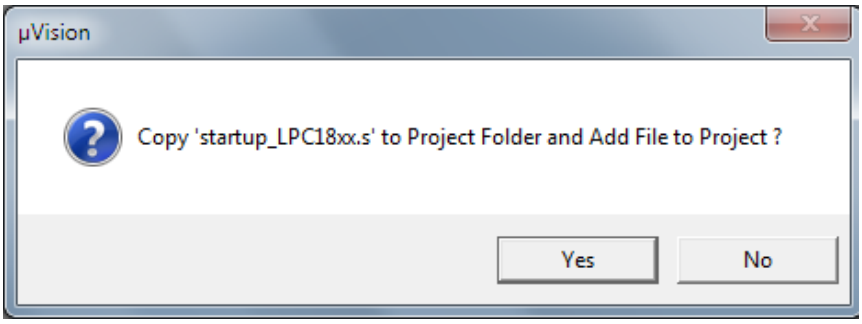

Fig.29

Step 8: Rename the ‘Source Group1’ to Startup.

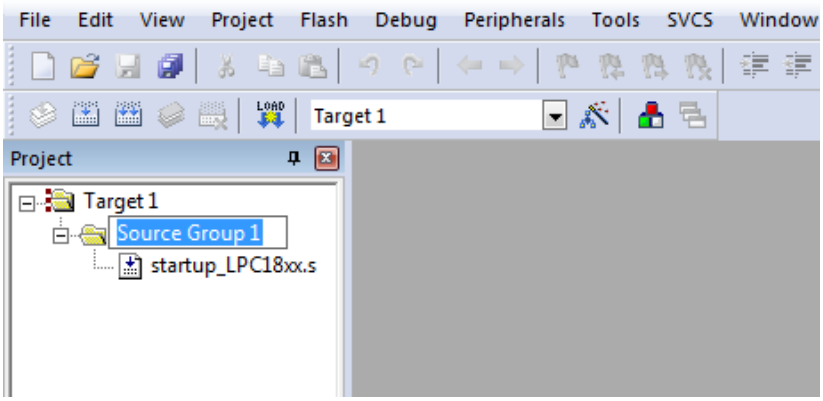

Fig.30

Step 9: Double click on Startup.

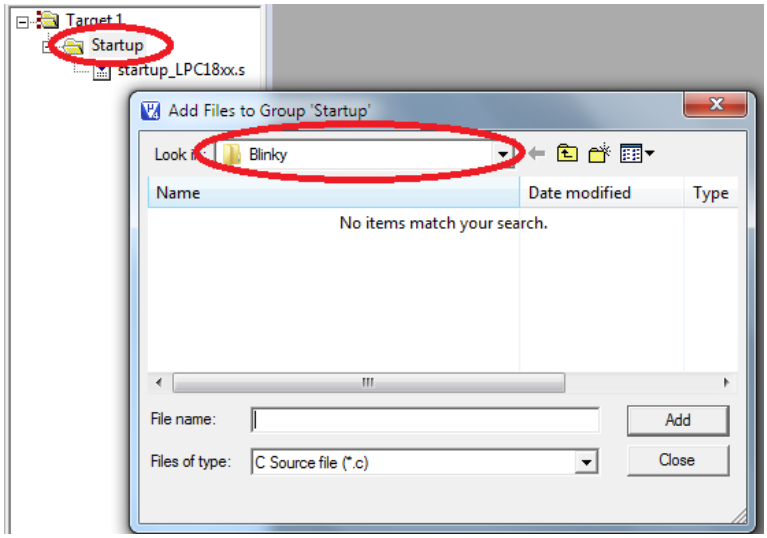

Fig.31

Step 10: Search ‘system_LPC18xx.c file’ (in the sample examples downloaded folder from NGX website), the file will be found at following path:
‘..\CMSISv2p10_LPC18xx_DriverLib\Core\Device\NXP\LPC18xx\Source\Templates’select ‘system_LPC18xx.c file’ and click Add as shown in the following image.

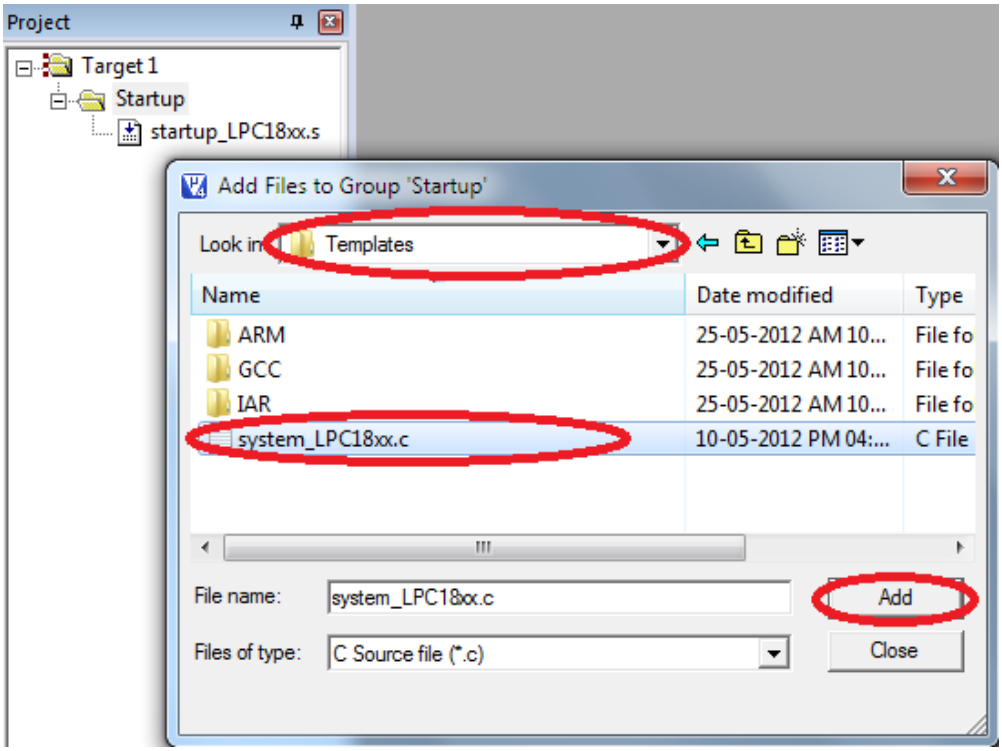

Fig.32

Step 10: Right click on Target to add a new group.

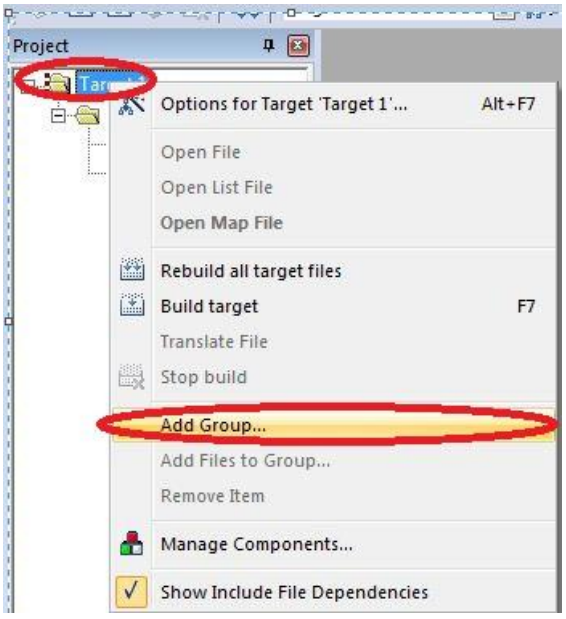

Fig.33

Step 11: Rename the 'New Group' to Drivers.

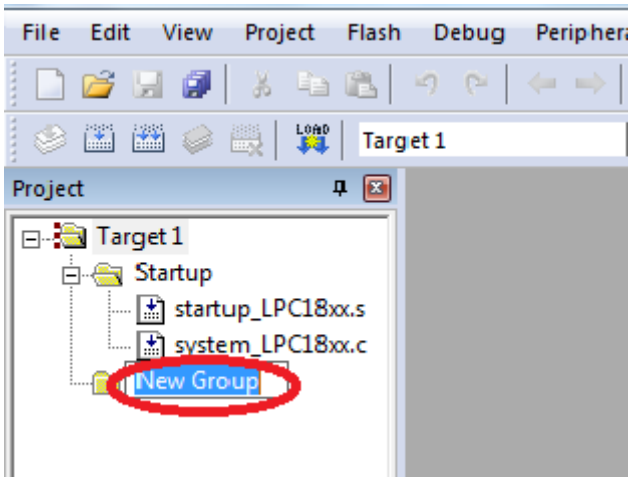

Fig.34

Step 12: Double click on Drivers and search the driver files (in the sample examples downloaded folder from NGX website) the driver files will be found at following path: **'..\CMSISv2p10_LPC18xx_DriverLib\src'** for blinky project we have to select lpc18xx_cgu.c, lpc18xx_gpio.c, lpc18xx_scu.c, lpc18xx_timer.c and lpc18xx_utils.c driver files and click Add.

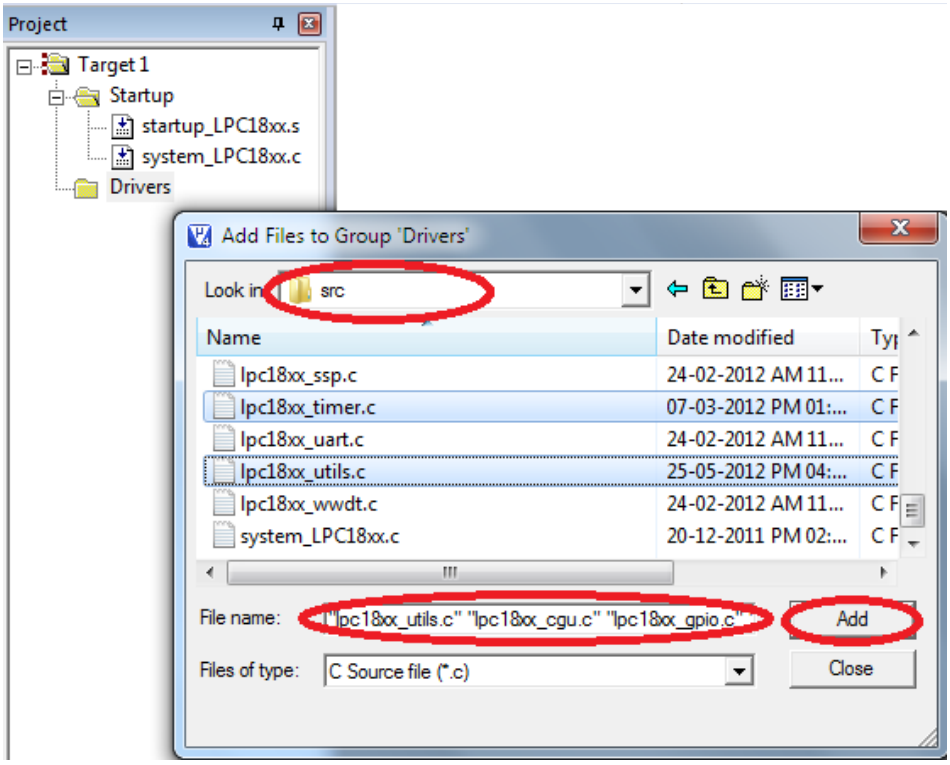

Fig.35

Step 13: Create another new group and rename it as Main.

Step 14: Click on New to create an empty document.

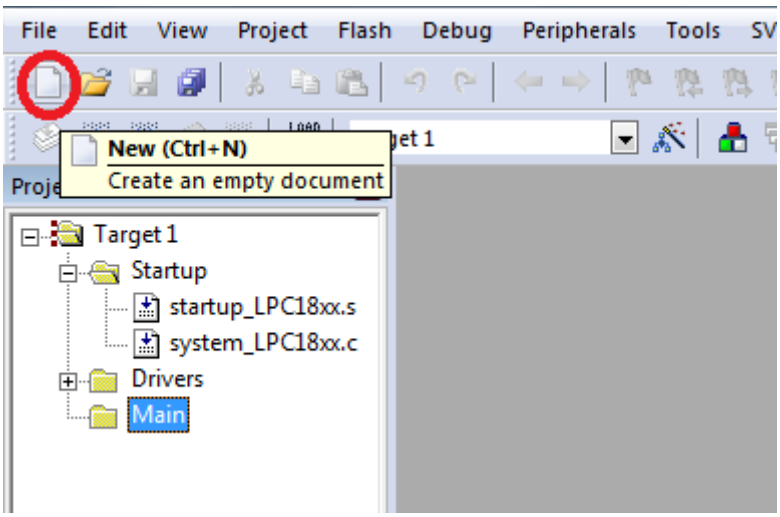

Fig.36

Step 15: Implement the C instructions need to blink a LED on Xplorer and save it to Main.c in 'Blinky folder' as shown in the following image.
(Note: Please refer Downloaded 'LPC1830_Xplorer_Blinky example')

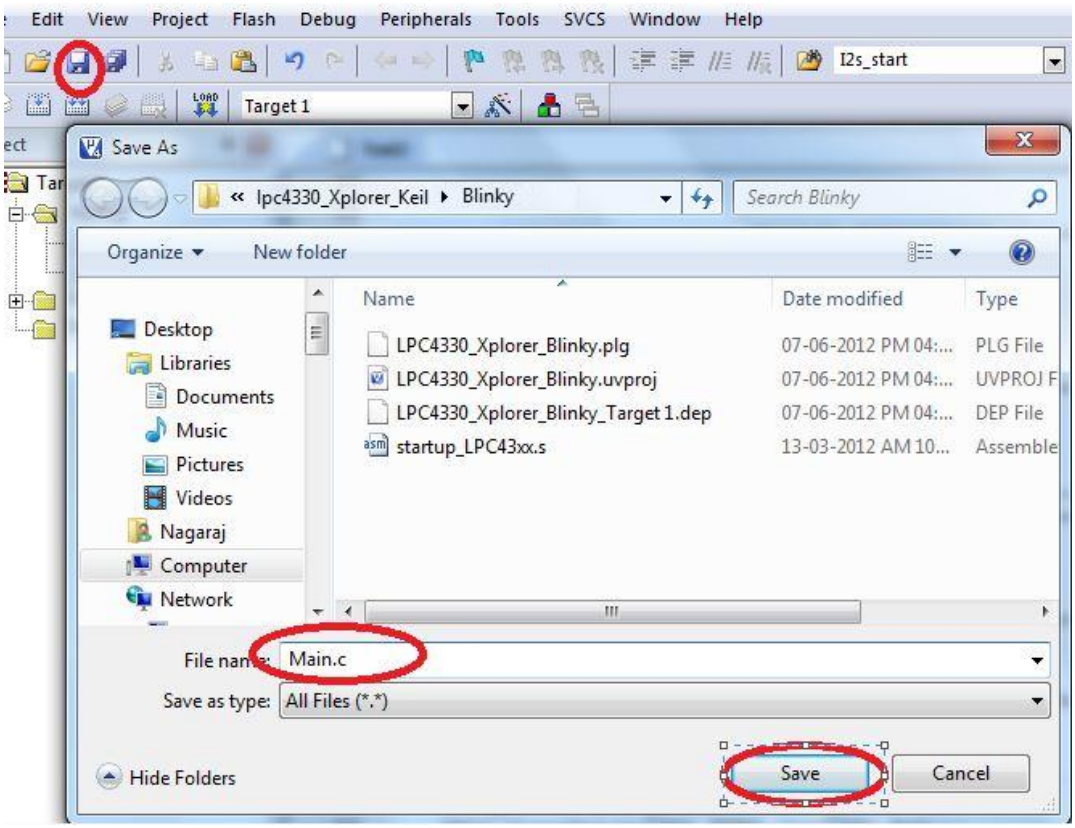

Fig.37

Step 16: Double click on Main Group, and select Main.c and click on Add

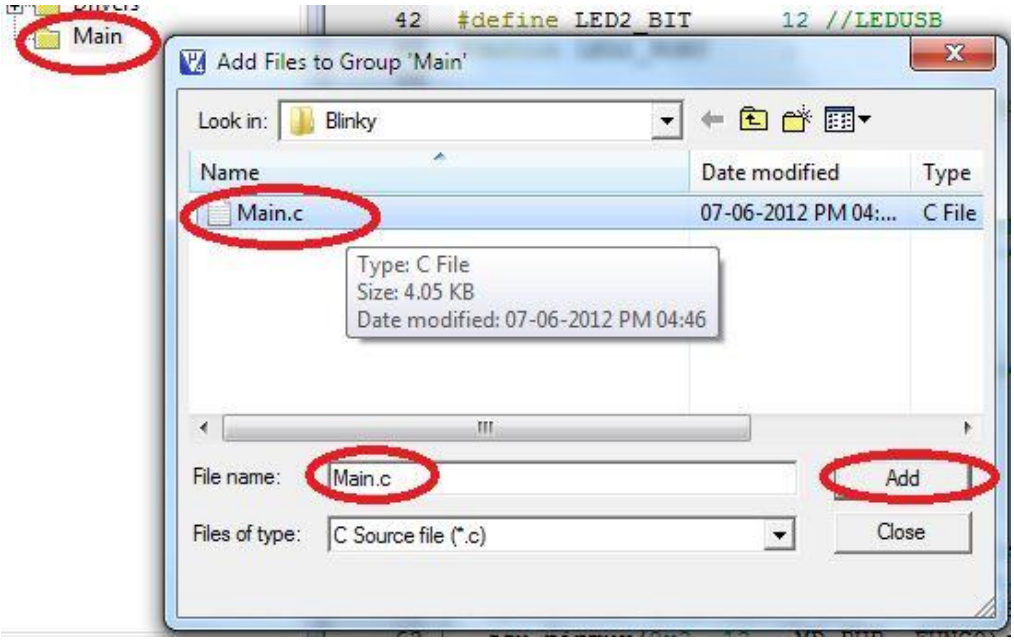

Fig.38

Step 17: Click 'Target Options', make following changes for 'Internal SRAM' as shown in the following image.

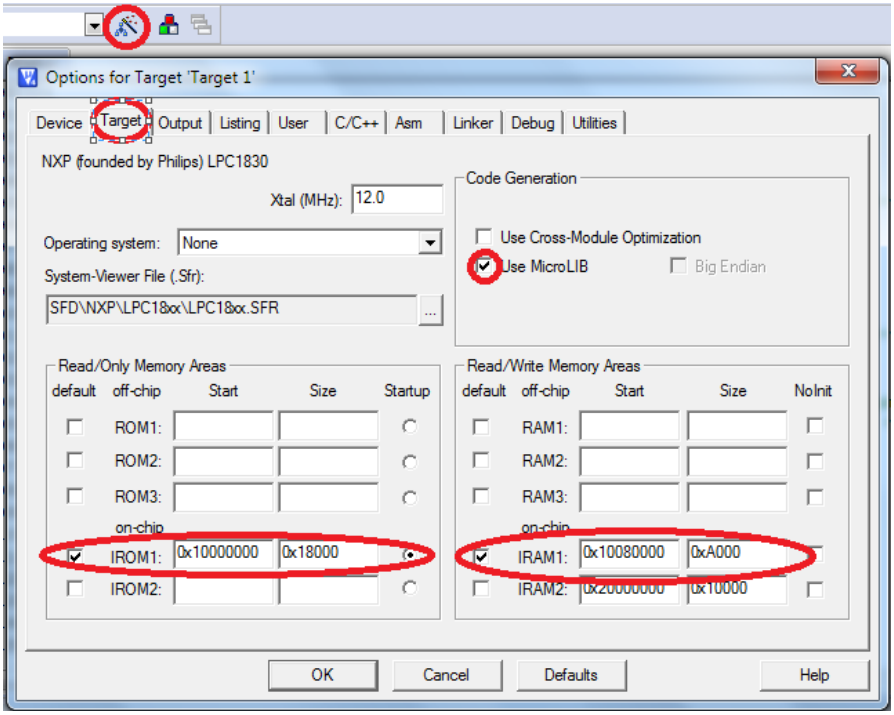

Fig.39

For ‘External SPIFI Flash’, make following changes as shown in the following image.

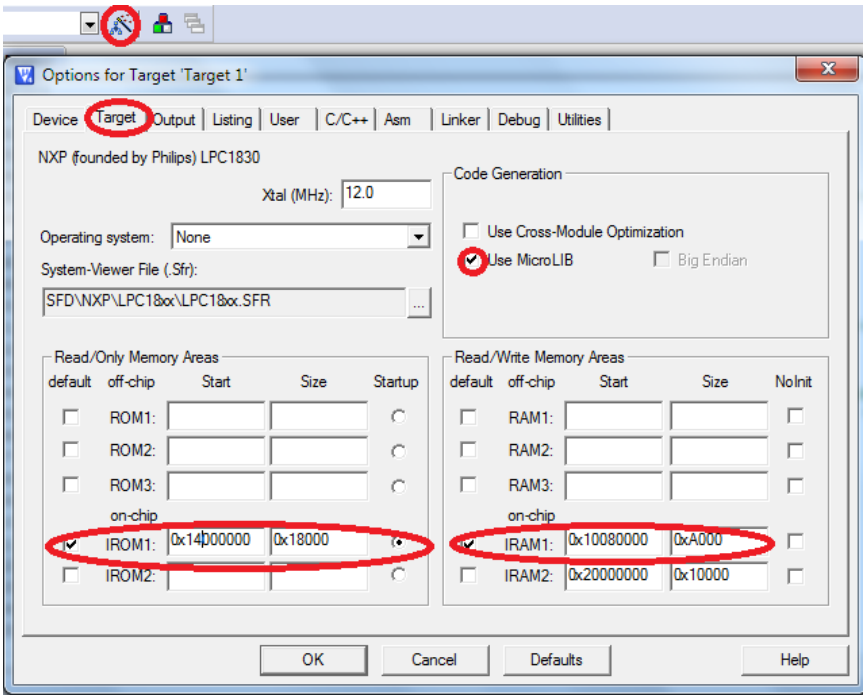

Fig.40

Step 18: In ‘Output Options’ select ‘Create HEX File’ check box.

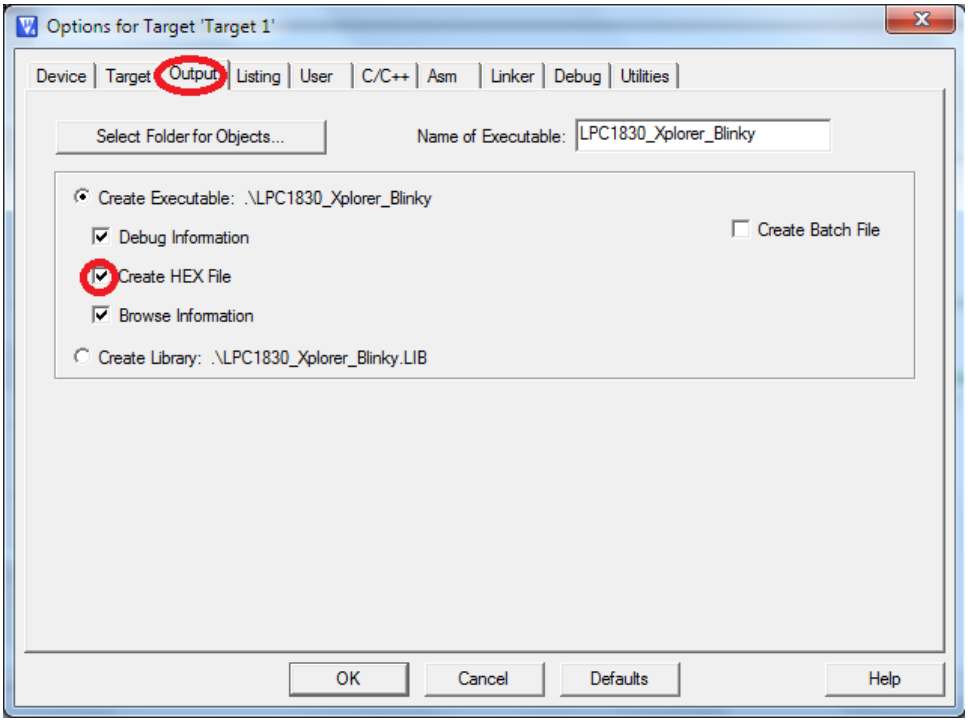

Fig.41

Step 19: Click ‘C/C++ option’, in Define type ‘CORE_M3’, click on ‘Include paths’ to include Drivers header file path as shown in the following image.

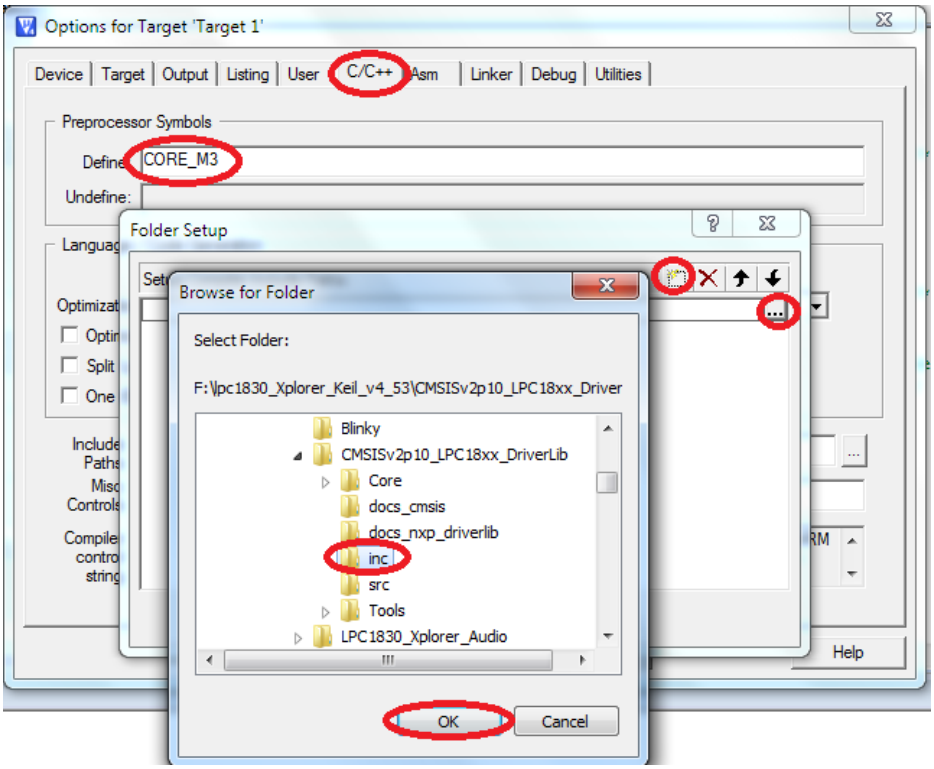

Fig.42

Step 20: In ‘Asm Option’, in Define type NO_CRP for assembly control symbols.

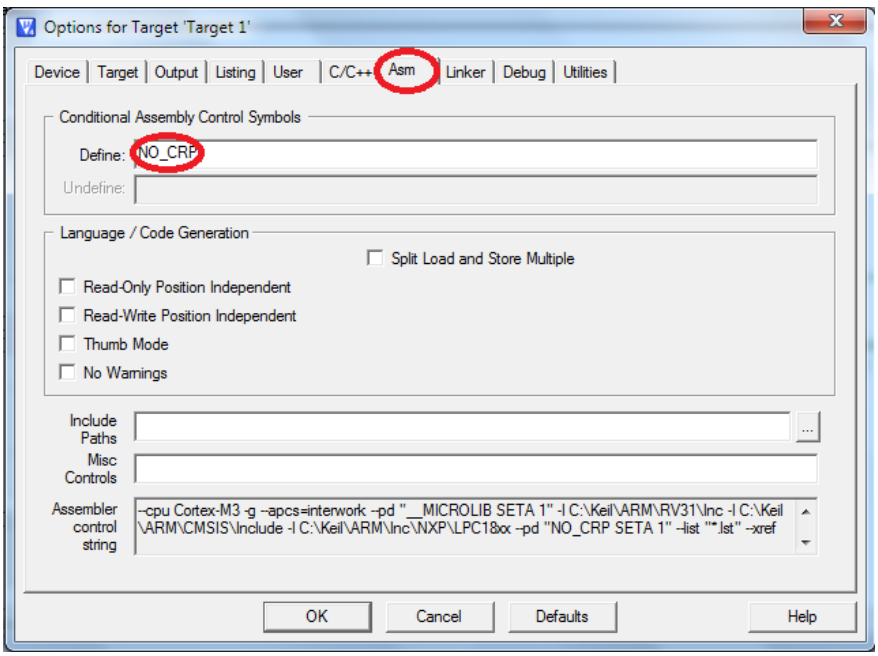

Fig.43

Step 21: In 'Debug Option', select 'ULINK2/ME Cortex Debugger' radio button and select 'Load Application at Startup' and 'Run to main()' check boxes, click on 'Initialization File': to select 'Internal SRAM.ini file', select 'Internal SRAM.ini file' and click Open as shown in the following image.

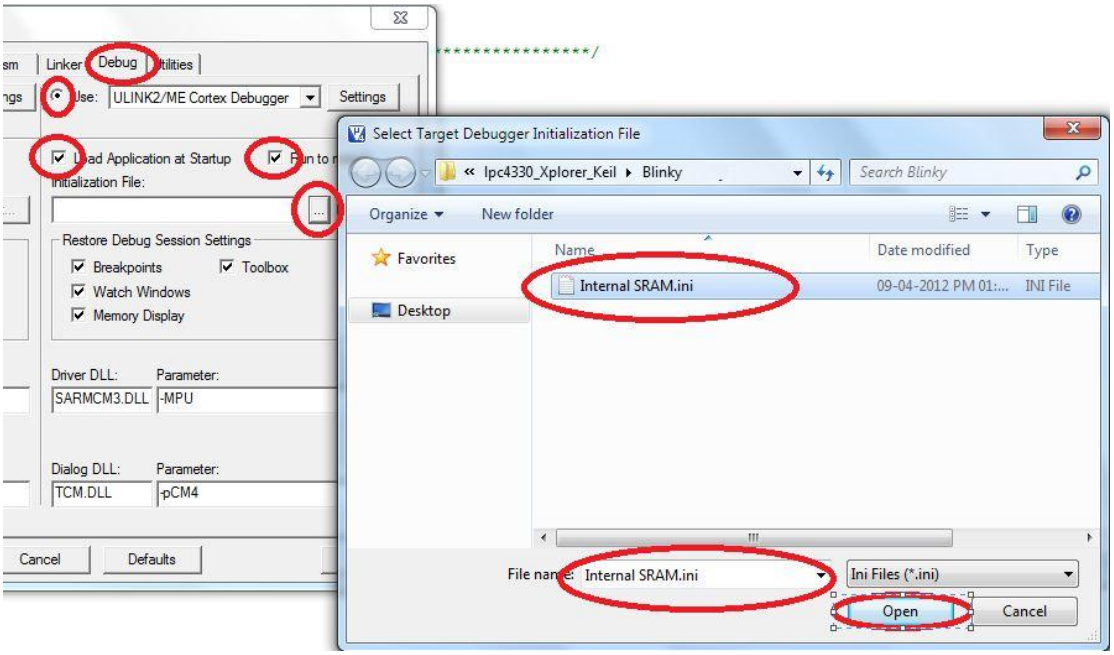

Fig.44

For 'External SPIFI Flash', make following changes as shown in the following image.

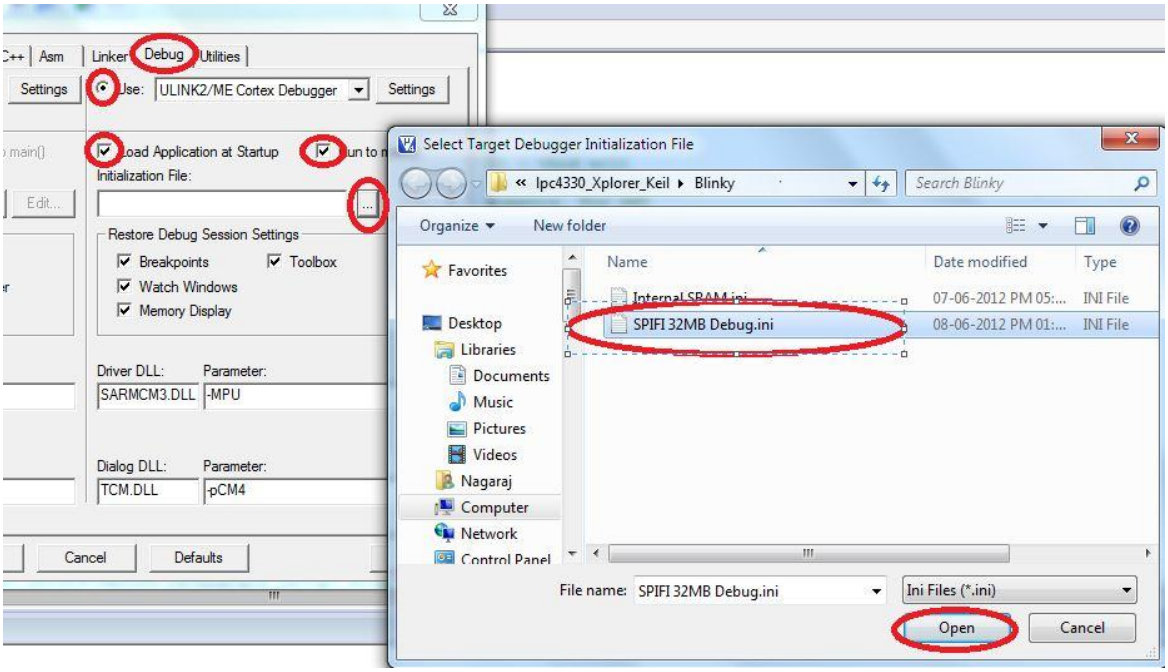

Fig.45

(Note: The 'ini file' will found at following path: ..\LPC1830_Xplorer_Blinky\Keil)

Step 22: In ‘Utilities Option’, select ‘Use External Tool for Flash Programing’.

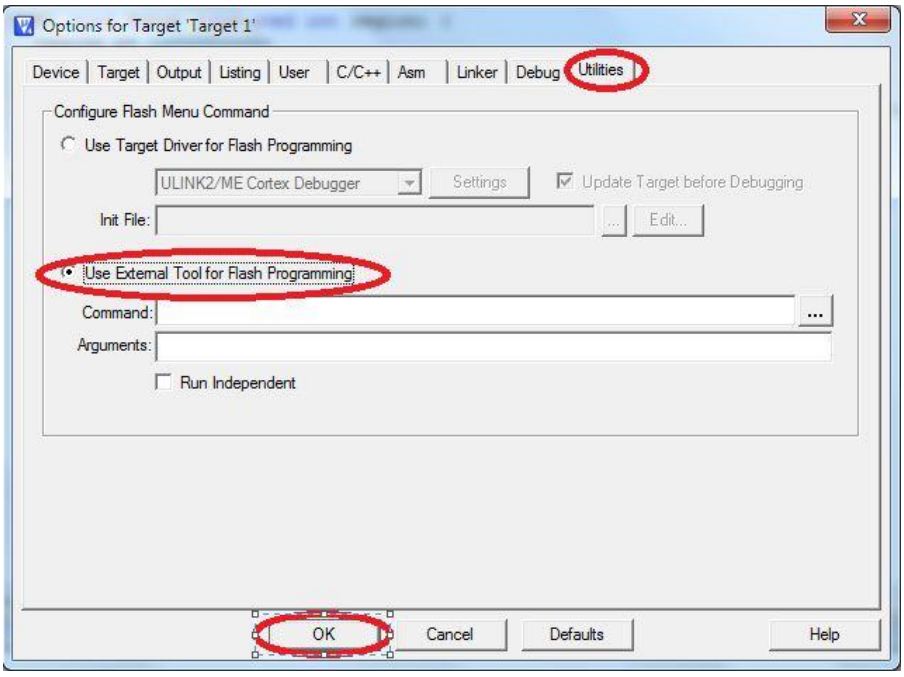

Fig.46

For ‘External SPIFI Flash’, select ‘Use Target Driver for Flash Programing’ as ‘ULINK2/ME Cortex Debugger’ and select ‘Update Target before Debugging’ check box then click ‘Setting Option’, remove the existing programing algorithm and click Add select ‘LPC18xx/43xx S25FL032 SPIFI Flash algorithm’ as shown in the following image.

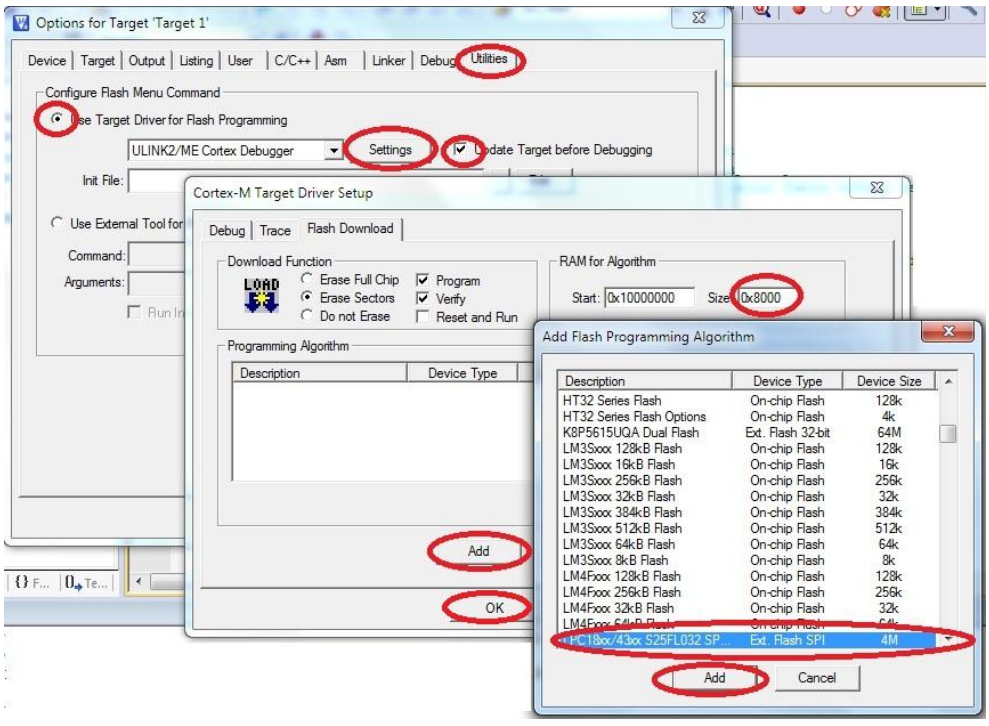

Fig.47

Step 23: In ‘Debug Option’, click on Edit... the ‘Internal SRAM.ini file’ will open in editor and OK.

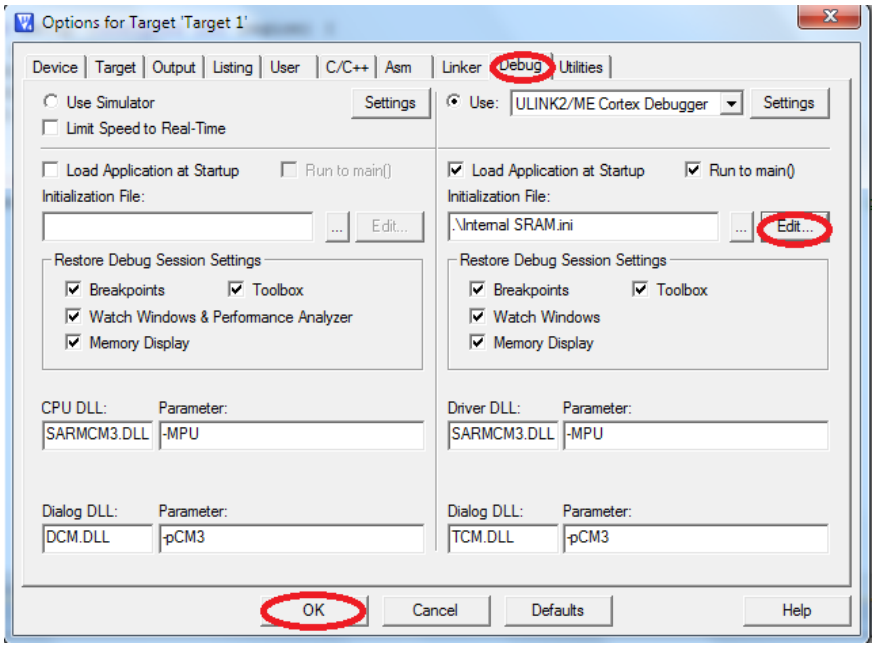

Fig.48

For ‘External SPIFI Flash’, click on Edit... the ‘SPIFI 32MB Debug.ini file’ will open in editor and OK.

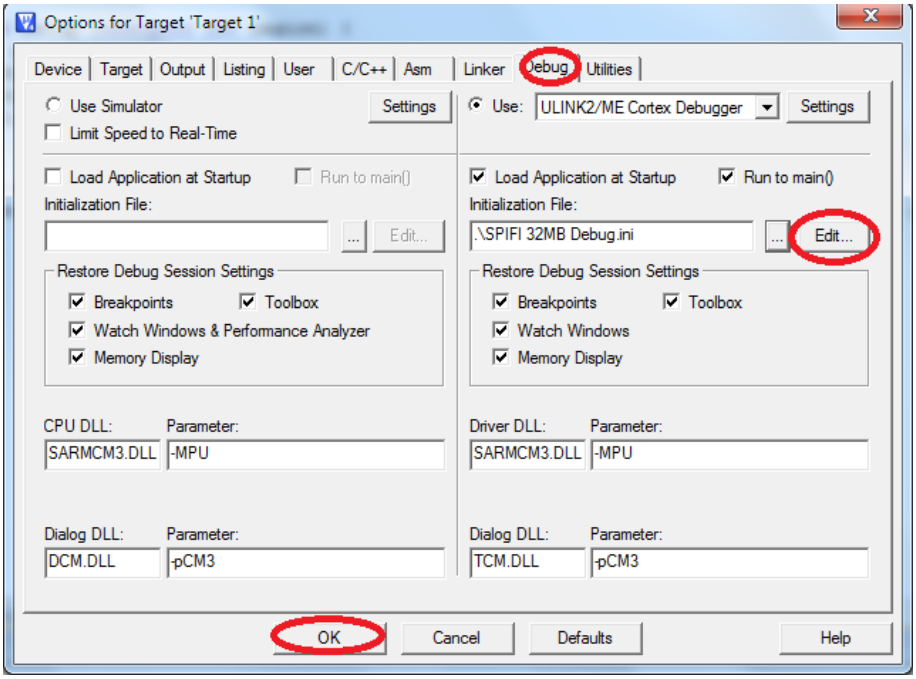

Fig.49

Step 24: Give the correct '.axf file' path in 'Internal SRAM.ini file' and file name should be same as shown in the following image.

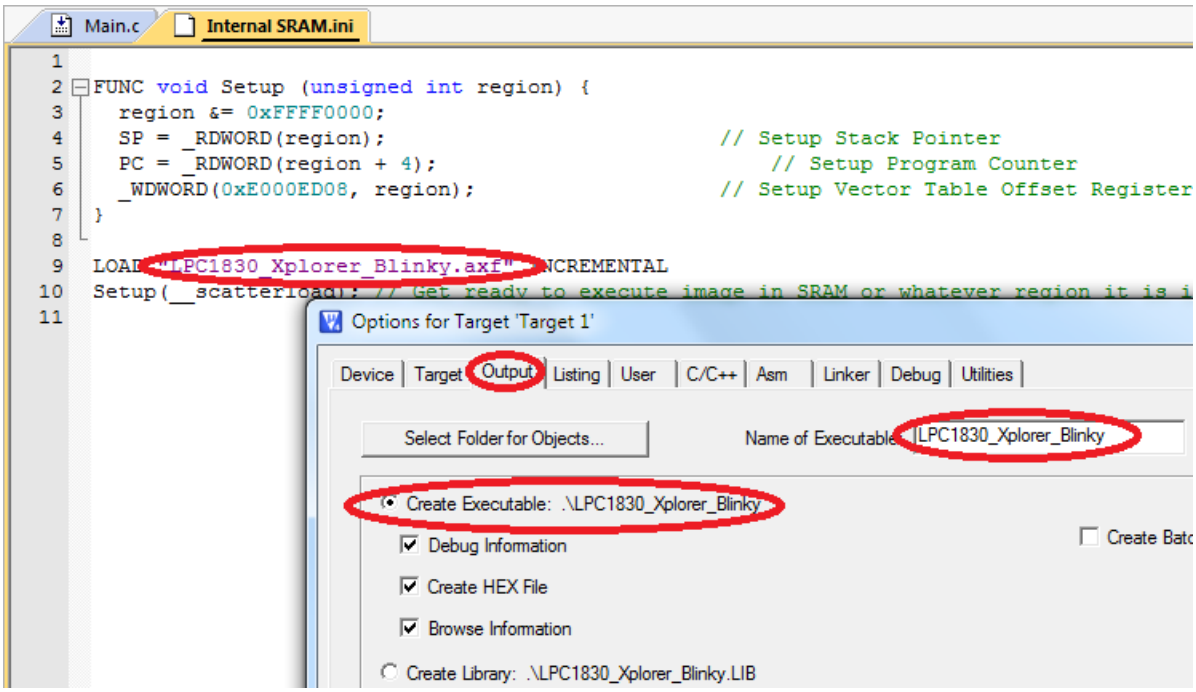

Fig.50

For 'External SPIFI Flash', Give the correct '.axf file' path in 'SPIFI 32MB Debug.ini file' and file name should be same as shown in the following image.

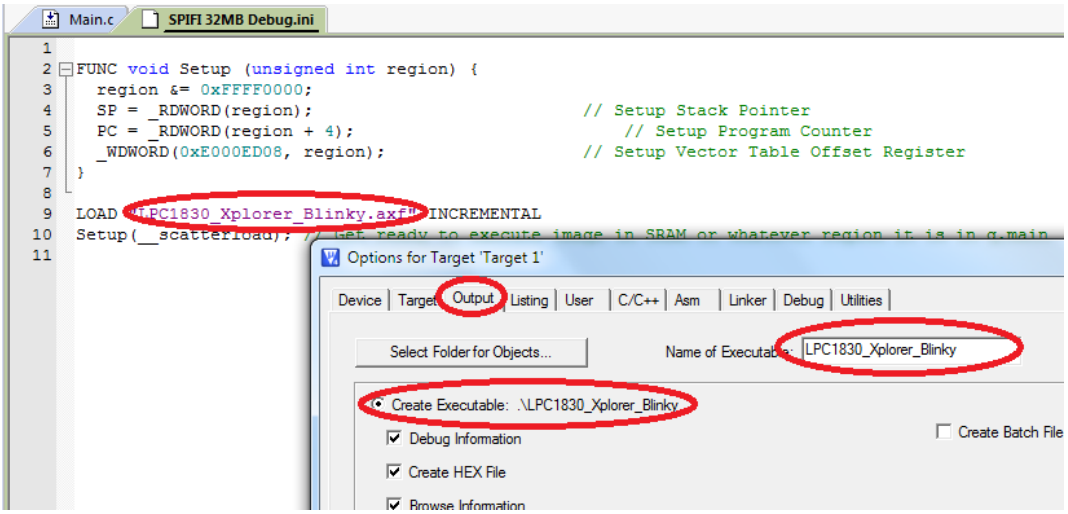

Fig.51

Step 25: Click on 'Build (F7)' to build a blinky project, the build should be error free.

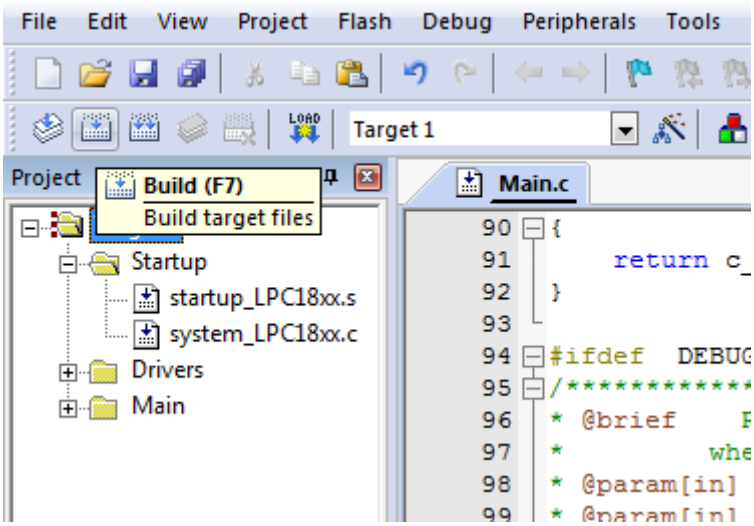

Fig.52

Step 26: Click on Debug -> 'Start/Stop Debug Session'.

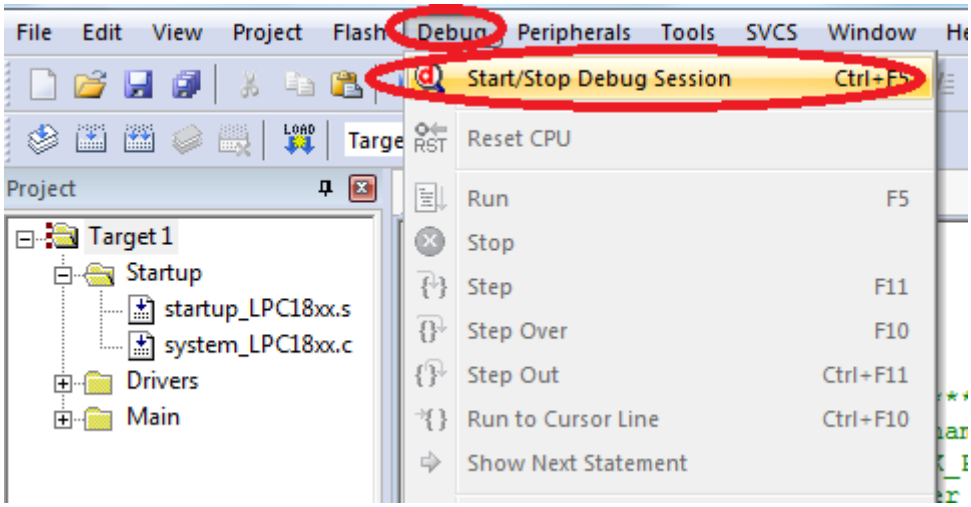

Fig.53

Step 27: Click on ‘Run (F5)’, on Xplorer board the LED D2 and D3 starts blinking.

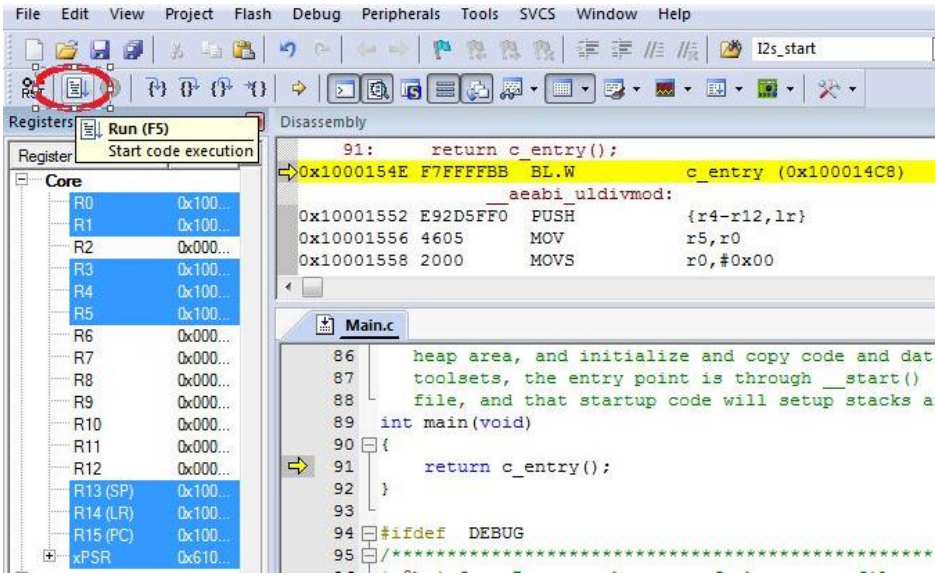

Fig.54

3.2 Executing the sample project in KEIL

Please note that the sample programs are available once the product is registered.

Steps to execute the sample project in 'Internal SRAM':

Step 1: Open project folder.
Step 2: Open project_name.uvproj file (Example: LPC1830_Xplorer_Blinky.uvproj.)

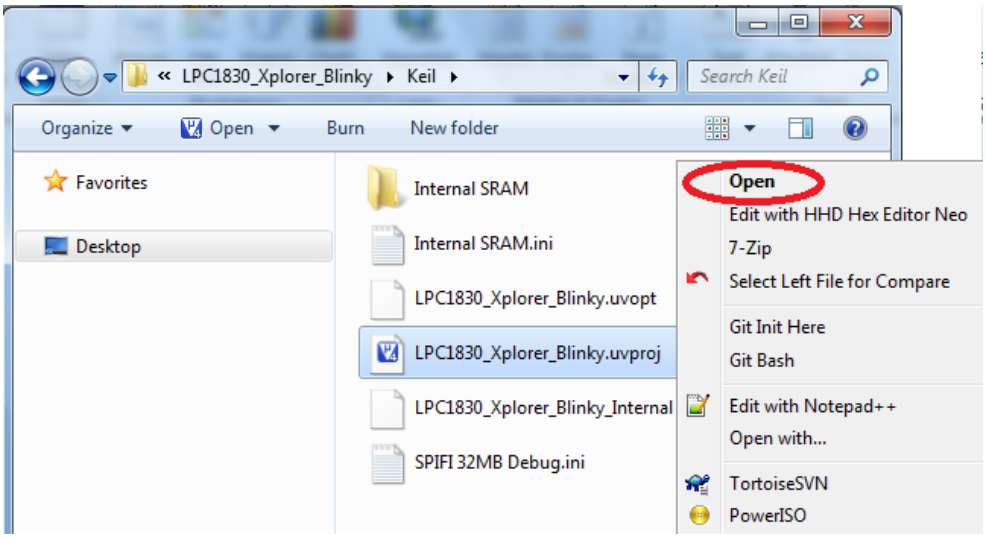

Fig.55

Step 3: This launches the IDE and double click on 'Main.c file', click on build, build must error free. Click on Debug -> 'Start/Stop Debug Session'.

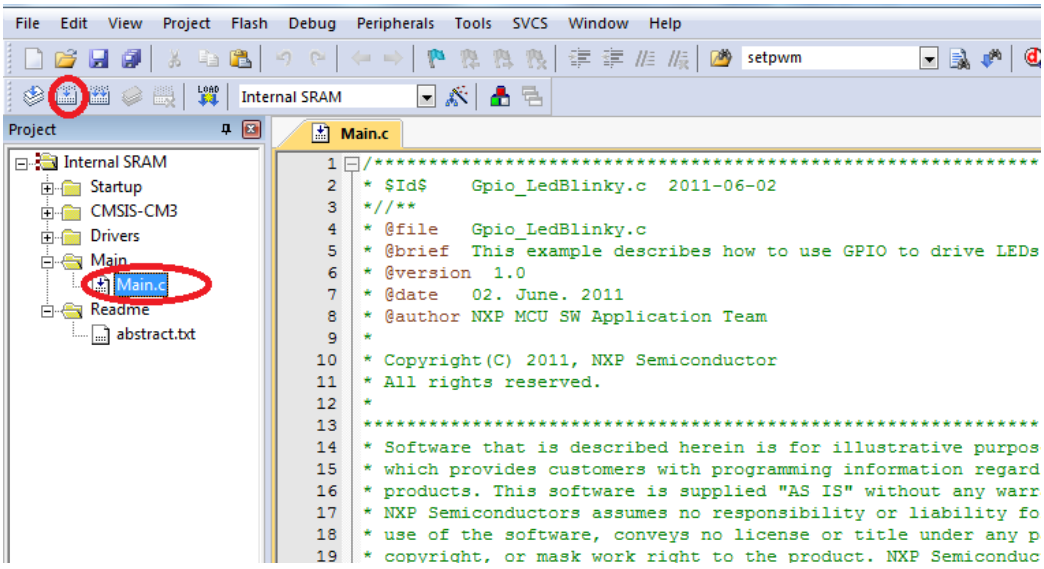
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
setpwm
Internal SRAM
Project
Internal SRAM
Startup
CMSIS-CM3
Drivers
Main
Main.c
Readme
abstract.txt
Main.c
/*****
* Id Gpio_LedBlinky.c 2011-06-02
*//**
* @file Gpio_LedBlinky.c
* @brief This example describes how to use GPIO to drive LEDs
* @version 1.0
* @date 02. June. 2011
* @author NXP MCU SW Application Team
*
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Fig.56

Step 4: Click Run (F5) to execute from the 'Internal SRAM', two LED's (D2 and D3) on Xplorer should blink.

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Steps to execute the sample project in ‘External Quad Flash’ (SPIFI 32MB Debug):

Step 1: Select ‘SPIFI 32MB Debug Option’ and click on build as shown in the following image.

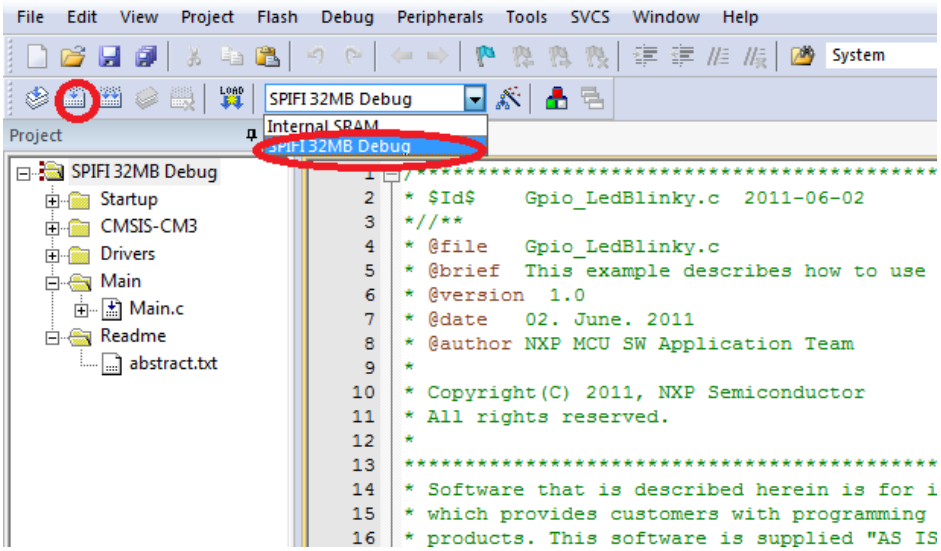


Fig.57

Step 2: The program can be debugged from the flash by clicking Debug -> ’Start/Stop Debug Session’, click Run (F5) to execute from the ‘External Quad Flash’ OR click on LOAD, the executable is loaded into ‘SPIFI 32MB flash’ then press RESET switch twice to run program from ‘External Quad Flash’, the two LED’s (D2 and D3) should start blinking on Xplorer.

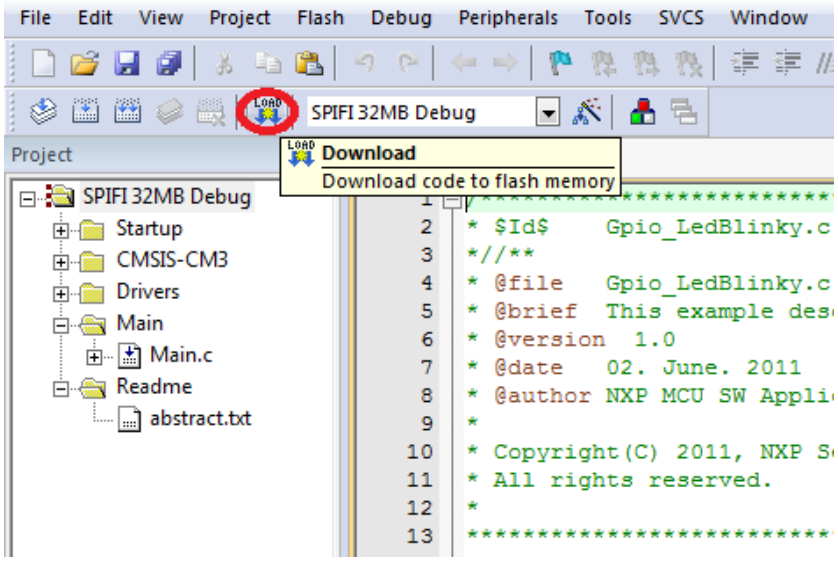


Fig.58

4.0 Restoring Xplorer to Factory Defaults

4.1 ULINK2/ME and KEIL

To restore the factory defaults for the Xplorer, User needs ULINK2/ME debugger to program the Xplorer to default firmware (i.e. **LPC4330_Xplorer_PeripheralTest.uvproj**).

Steps to restore the factory defaults for Xplorer:

Step 1: Open **LPC1830_Xplorer_Default_Setting** folder and double click on **LPC1830_Xplorer_PeripheralTest.uvproj** project.

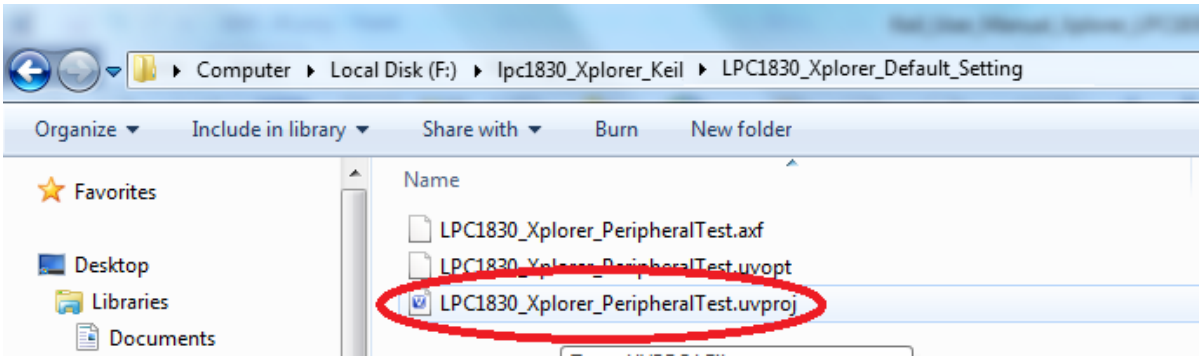


Fig.59

Step 2: Click on LOAD, the **LPC1830_Xplorer_PeripheralTest.axf** will flash on to SPIFI Flash. Now, RESET twice to restore the Xplorer to factory default.

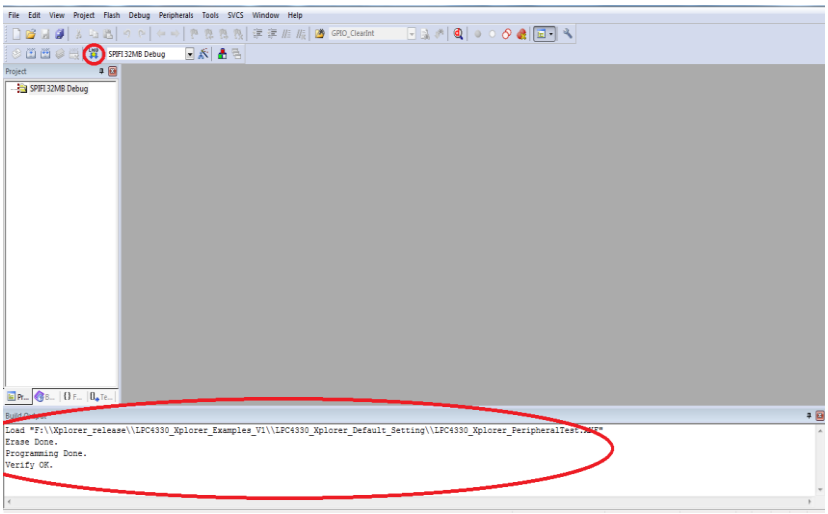


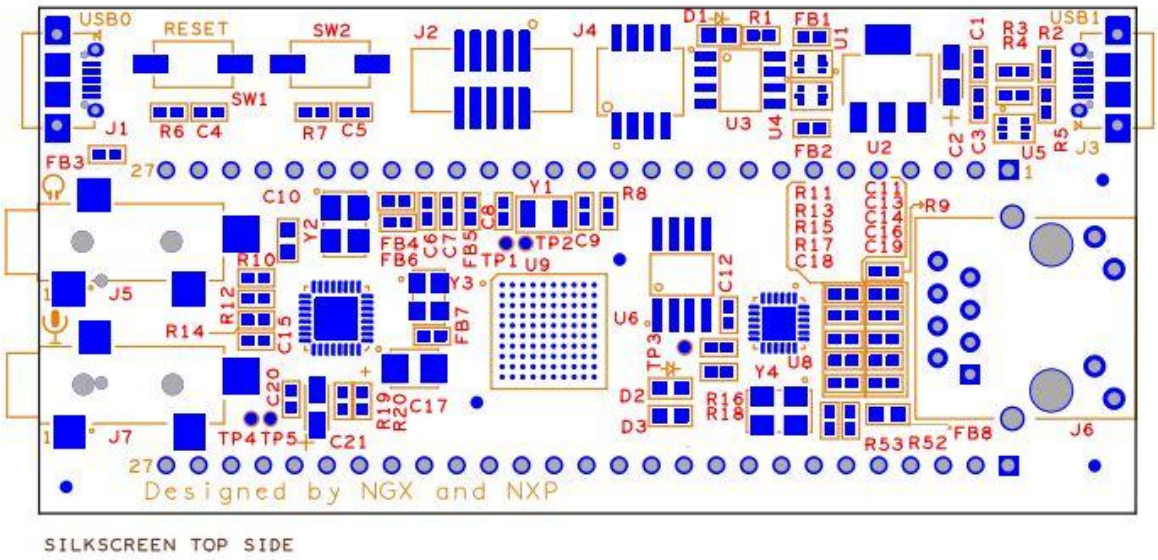
Fig.60

5.0 Schematic & Board Layout

5.1 Schematic

This manual will be periodically updated, but for the latest documentations please check our website for the latest documents. The Board schematic and sample code are available after the product has been registered on our website.

5.2 Board layout



SILKSCREEN TOP SIDE

Fig.61

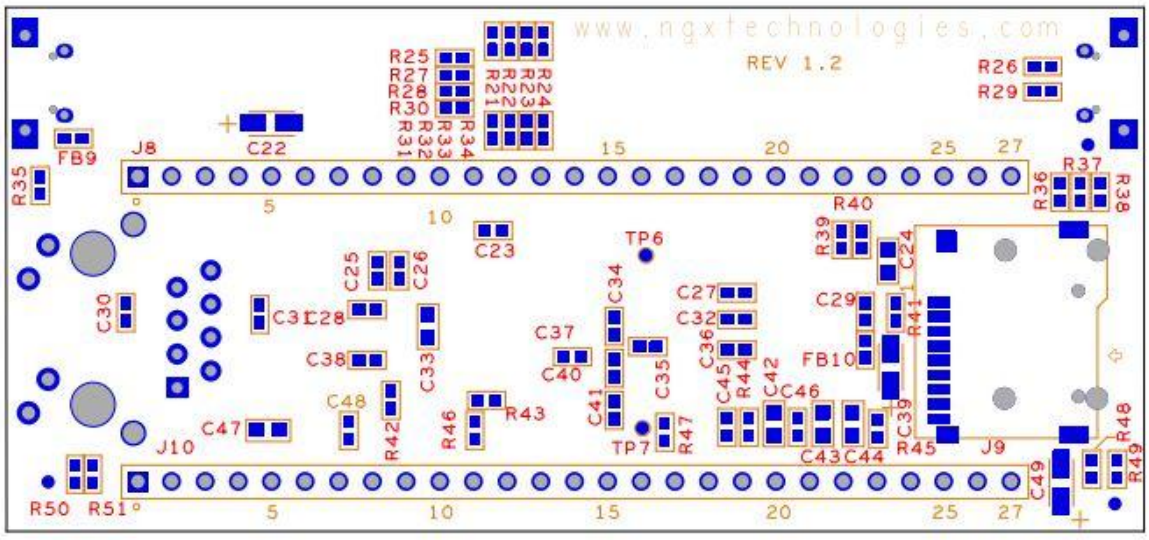


Fig. 62

6.0 CHANGE HISTORY

6.1 Change History

Rev	Changes	Date (dd/mm/yy)	By
1.0	Initial release of the manual	29/03/2012	Ashwin Athani
1.1	• Added section for Restoring Xplorer to factory defaults in KEIL	10/04/2012	Nagaraj Baddi
1.2	• The Keil User Manual separated. • Creating the sample Blinky project in KEIL added	08/06/2012	Nagaraj Baddi

About this document:

Revision History

Version: V1.2 author: Nagaraj Baddi

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